Solid State
CONSOLETTE
BASE STATION
136-174 MHz

68P81018E45-C

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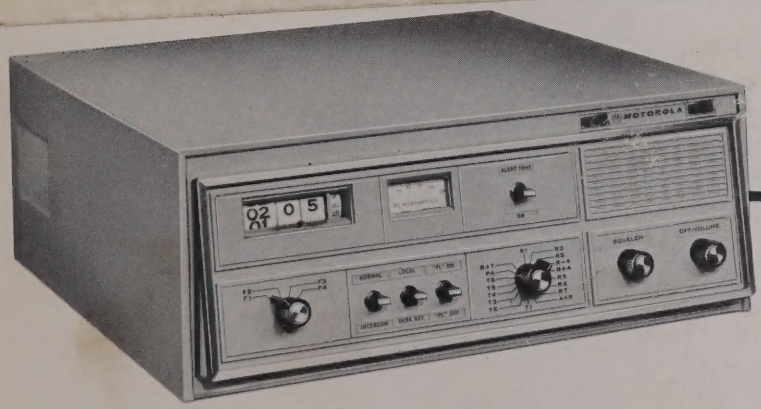

MOTOROLA

APPROVAL AND PROCUREMENT RECORD PAGE

APPROVAL DATA FOR NAVSHIPS 0967-289-1010

TITLE OF MANUAL: INSTRUCTION MANUAL
FOR
CONSOLETTE BASE STATION, HANDIE TALKIE,
BATTERY CHARGER AND ANTENNA

APPROVAL AUTHORITY:
Ninth Naval District Ltr.
Ser 270jd691 23 May 1972

CONTRACT NUMBER	VESSELS APPLICABILITY	QTY OF MANUALS	QTY OF EQUIPMENT	BUILDING YARD
N00024-72-C-0216	YTB TUGS 816-827	63	12	Marinette Marine Corp. Marinette, Wisconsin
N00024-73-C-0295	YTB TUGS 828-836	53	9	Marinette Marine Corp. Marinette, Wisconsi

REMARKS:

CERTIFICATION: DATE: December 3,1973

IT IS HEREBY CERTIFIED THAT NAVSHIPS 0967-289-1010 TO BE PROVIDED UNDER THIS CONTRACT N00024-73-C-0295 HAS BEEN APPROVED BY THE APPROVAL DATA SHOWN ABOVE.

Norma La Lewis for
MANUFACTURER'S SIGNATURE

MOTOROLA INC.
SCHAUMBURG, ILLINOIS 60172

CUSTOMER QUESTIONNAIRE

To the Reader of This Instruction Manual:

Motorola is engaged in a continuous program of improving its instruction literature. We believe that you can aid us in this program, so that we in turn can better help you service our equipment. To foster these aims, would you please answer the following questions:

First Fold

SCHEMATIC DIAGRAMS AND CABLING DIAGRAMS

First Fold

1. ☐ Are accurate and easy to follow
2. ☐ Contain minor errors
3. ☐ Contain major errors
4. ☐ Are difficult to follow

If you have checked any box except 1, please tell us what schematic diagrams, or portions thereof, were at fault, or enter other comments.*

_____

_____

68P85901D80-E

TEXT

1. ☐ Easy to follow – helps to service equipment
2. ☐ Would like more information on*

Second Fold

_____

Second Fold

_____

3. ☐ Some instruction sections are too long or superfluous such as*

_____

_____

4. ☐ Other comments*

_____

_____

_____

(continued on reverse side)

PARTS LIST

1. ☐ Are complete and accurate
2. ☐ Would like more information as follows*

_____

_____

ILLUSTRATIONS IN GENERAL

1. ☐ Are complete and accurate
2. ☐ Want more illustrations such as*

_____

_____

3. ☐ Some are superfluous such as*

_____

_____

The name of my instruction manual is:

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_____

(This number will be found on the cover or on the title page)

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*Whenever possible, give complete model No. of equipment, and part No. of diagram or part No. of instruction section. This information is important.

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MOTOROLA

SOLID-STATE

"CONSOLETTE" BASE STATION

FM TWO-WAY RADIO

1.5, 10/30, & 45 W RF POWER

136-174 MHz 120 V AC

AEPD-18545-A

MOTOROLA INC.
Communications Division
SCHAUMBURG, ILLINOIS 60172

CANADIAN MOTOROLA*
ELECTRONICS LIMITED
WILLOWDALE, ONTARIO

SOLID-STATE "CONSOLETTE" BASE STATION IS MANUFACTURED AND SOLD IN BOTH LOCATIONS.
*(MANUFACTURED AND SOLD IN CANADA UNDER PATENT AND TRADEMARK LICENSES FROM MOTOROLA, INC., FRANKLIN PARK, ILLINOIS, U.S.A.)

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12/10/73 -UP

68P81018E45

Issue - C

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SPECIFICATIONS

AC INPUT REQUIREMENT	OPERATIONAL MODE	1.5 W MODELS	10 W MODELS	30 W MODELS	45 W MODELS
@120 V	RECEIVE (STANDBY)	0.5 Amperes			
	TRANSMIT	1.5 Amperes	3.0 Amperes		3.5 Amperes
@220 OR 240 V	RECEIVE (STANDBY)	0.25 Amperes			
	TRANSMIT	0.75 Amperes	1.5 Amperes		1.8 Amperes
FREQUENCY RANGE		136-174 MHz			
METERING		A single scale, 0-50 microampere meter with 20,000 ohms equivalent series resistance or Motorola portable test set can be used to measure all circuits essential to tuning and checking.			
DIMENSIONS		6-3/4" high x 16-3/4" wide x 20" long			
WEIGHT		Approximately 50 lbs. (shipping weight including accessories: Approximately 54 lbs.).			

TRANSMITTER

RF POWER OUTPUT	1.5 Watts	10 Watts	30 Watts	45 Watts
OUTPUT IMPEDANCE	50 Ohms			
SPURIOUS & HARMONIC EMISSIONS	Spurious and harmonics more than 85 dB below carrier for 10, 30 or 45 Watt models, more than 65 dB for 1.5 Watt models (per EIA spec RS-152B, par. 4).			
FREQUENCY STABILITY	A temperature compensated quartz crystal maintains oscillator frequency within ±.0005% of reference frequency from -30°C to +60°C ambient (+25°C reference) and ±.0005% with a 20% primary voltage deviation.			
MODULATION	16F3 (voice), 15F2 (tones): ±5 kHz for 100% at 1000 Hz @136-174 MHz.			
AUDIO SENSITIVITY	.120 volt ±3 dB for 3.0 kHz deviation at 1000 Hz			
FM NOISE	-55 dB below ±3.0 kHz deviation at 1000 Hz			
AUDIO RESPONSE	+1, -3 dB of 6 dB/octave pre-emphasis characteristic from 300 to 3000 Hz			
AUDIO DISTORTION	less than 3% at 1000 Hz for ±3.0 kHz deviation			

RECEIVER

CHANNEL SPACING		30 kHz
SELECTIVITY	-EIA SINAD	-90 dB at ±30 kHz
EIA SINAD INTERMODULATION	TLD1770A-SERIES RF DECK (STD)	-80 dB
	TLD8370A-SERIES RF DECK (OPTION)	-70 dB
EIA MODULATION ACCEPTANCE		±6.5 kHz minimum
SENSITIVITY (50-OHMS RF INPUT IMPEDANCE)	TLD1770A-SERIES RF DECK (STD)	Less than 0.50 microvolts for 20-dB quieting. Less than 0.35 microvolt for EIA SINAD.
	TLD8370A-SERIES RF DECK (OPTION)	Less than 0.35 microvolt for 20-dB quieting. Less than 0.25 microvolt for EIA SINAD.
FREQUENCY STABILITY		A quartz crystal maintains oscillator frequency within ±.0005% of reference frequency from -30°C to +60°C ambient (+25°C reference) and ±.0005% with a 20% primary voltage deviation.
SPURIOUS & IMAGE REJECTION	TLD1770A-SERIES RF DECK (STD)	more than 100 dB
	TLD8370A-SERIES RF DECK (OPTION)	more than 90 dB

SPECIFICATIONS (Cont'd)

RECEIVER (Cont'd)

SQUELCH	Carrier squelch; noise compensated type, adjustable sensitivity, threshold sensitivity of 0. 18 microvolt. "Private-Line" tone-coded squelch; threshold sensitivity of 0. 18 microvolt.
AUDIO OUTPUT	5 watts to a 3. 2 ohm load measured at the receiver output at less than 5% distortion.
AUDIO RESPONSE	+2, -8 dB/octave de-emphasis characteristic from 300 to 3000 Hz

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

FCC LICENSE DESIGNATIONS

	Single Frequency	Multiple Frequency
1.5 Watt	CC3143	None
10 Watt	CC3142	None
30 Watt	CC3132	CC3133
45 Watt	CC3134	CC3135

D. O. C. LICENSE DESIGNATION: TYPE BBHA

Approval No. 109264227

EPS-11245-A

FOREWORD

SCOPE OF INSTRUCTION MANUAL

This manual offers descriptive and service information for the radios described in it. Service diagrams, parts lists, and printed circuit board details are also included.

NOMENCLATURE

Motorola radio equipment is specifically identified by the model number on the nameplate.

NOTE

Be sure to use the entire model number when making inquiries about your equipment.

Identifiers have been assigned to chassis and kits. Use these identifiers when requesting information or ordering replacements.

PRODUCTION CHANGES

When production and engineering changes are incorporated into the equipment, a revision numeral is assigned to the chassis or kit affected.

Typical Example:
The Model TRD1432AA becomes
TRD1432AA-1 with the first revision.

This chassis number complete with revision numeral, if any, is stamped on the chassis at the time of production. The revision numeral becomes an integral part of the chassis identifier.

INSTRUCTION MANUAL REVISIONS

Changes which occur after an instruction manual is printed are described in the Instruction Manual Revision. These bulletins give the reader complete information on the change including pertinent parts listing data.

NATIONAL SERVICE ORGANIZATION

Motorola provides a nation-wide service organization. Through its maintenance and installation program Motorola makes available the finest service to those desiring reliable continuous communications on a contract basis.

The largest service organization specializing in mobile communications is Motorola's National Service Organization. Over 800 strategically located, adequately staffed and trained, independently owned and operated stations, manned with several thousand FCC licensed personnel constitute the sub-contracting force.

The administrative forces of area and district service managers and district service representatives are in the direct employ of Motorola.

For your contract service requirements, please contact your local Motorola representative or write to:

National Service Manager
Motorola Communications Division
1301 E. Algonquin Road, Schaumburg, Ill. 60172

CAREFUL USE OF THE INSTRUCTION MANUAL AND THE MANY SUGGESTIONS CONTAINED IN IT WILL FURTHER INSURE PROPERLY INSTALLED AND MAINTAINED RADIO EQUIPMENT.

68P81002E32-D

THE EQUIPMENT DESCRIBED IN THIS MANUAL IS MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING MOTOROLA U.S. PATENTS:

RE-24,815	2,834,879	3,059,184	3,204,202	3,306,990	3,387,270
RE-26,079	2,883,521	3,061,785	3,205,455	3,307,051	3,400,219
RE-26,361	2,888,652	3,070,737	3,218,587	3,307,121	3,409,841
2,626,384	2,899,547	3,070,748	3,223,953	3,323,065	3,414,881
2,637,782	2,901,601	3,083,332	3,233,243	3,324,408	3,416,032
2,650,333	2,912,573	3,087,117	3,234,469	3,327,215	3,424,854
2,688,059	2,918,571	3,087,998	3,247,475	3,328,695	3,424,983
2,691,094	2,924,705	3,087,999	3,250,997	3,328,727	3,430,171
2,691,560	2,925,562	3,091,736	3,250,999	3,333,151	3,431,486
2,699,425	2,938,082	3,094,293	3,256,497	3,333,911	3,437,838
2,705,281	2,963,577	3,101,441	3,263,172	3,334,293	3,437,934
2,731,555	2,966,585	3,119,093	3,273,083	3,335,405	3,441,854
2,738,466	2,974,221	3,126,514	3,275,938	3,336,533	3,447,133
2,740,891	2,984,740	3,128,431	3,281,697	3,341,777	3,448,342
2,743,361	2,994,844	3,129,396	3,284,714	3,345,568	3,449,680
2,759,052	3,009,115	3,131,354	3,289,098	3,345,569	3,453,521
2,759,103	3,014,127	3,149,317	3,292,085	3,345,573	3,454,927
2,777,950	3,027,454	3,175,183	3,293,644	3,348,148	3,458,664
2,799,010	3,027,455	3,175,187	3,300,723	3,355,533	3,465,294
2,808,507	3,039,081	3,175,193	3,304,501	3,355,709	3,469,191
2,809,236	3,041,550	3,183,382	3,304,503	3,369,597	3,471,796
2,830,200	3,048,659	3,191,123	3,305,779	3,370,236	3,471,805
2,833,994	3,048,747			3,373,379	3,473,152

Other U.S. Patents Pending

PARTS AND SERVICE

REPLACEMENT PARTS ORDERING

ORDERING INFORMATION

Motorola maintains parts depots strategically located throughout the country. These facilities are fully equipped to give the finest service. Orders for all parts except crystals, channel elements, and "Vibrasender" and "Vibrasponder" resonant reeds should be sent to the nearest parts depot. Orders for crystals, channel elements and reeds should be sent to the factory address listed. Orders for instruction manuals should also be sent to the parts and service depots.

When ordering replacement parts, the complete number identification of the item must be used whether it be a component, kit or complete chassis. This will fix proper identification and assure delivery of the desired item. Complete number identification should also be used when requesting equipment information.

Crystal and channel element orders should specify the crystal or channel element type number, crystal frequency, carrier frequency, and the chassis model number in which the part is used.

Orders for "Vibrasender" and "Vibrasponder" resonant reeds should specify type number and frequency and should identify the owner/operator of the communications systems in which these items are to be used.

68P81001E43-L

MOTOROLA INC.
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Executive Offices: 1301 E. Algonquin Road, Schaumburg, Illinois 60172

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Parts Department
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The largest service organization specializing in mobile communications is Motorola's National Service Organization. Over 800 strategically located, adequately staffed and trained, independently owned and operated stations manned with several thousand FCC licensed personnel constitute the sub-contracting force.

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68P81001E43-L

CONTENTS

SECTION	SECTION OR PAGE NUMBER
Specifications	ii
Replacement Parts Ordering	vi, vii
Radio Set Model Chart	xi
DESCRIPTION	68P81019E54
Introduction	1
Basic Types of Stations	1
Control Facilities	2
Description of Items	2
Typical System Applications	3
Local Control Station Functional Description	5
Required Accessory	9
Optional Accessories	9
INSTALLATION AND OPERATION	68P81010E84
Inspection	1
Antenna and Transmission Line Considerations	1
Installation of Cabinet	1
Initial Adjustments and Pre-Operational Checks	4
Operating Instructions	5
CONTROL PANEL AND CHASSIS	68P81010E93
Description	1
Maintenance	1
Wiring Diagram	7
Parts List	8
TRANSMITTER-RECEIVER	68P81019E57
Model Table	1
Technical Characteristics	2
Description	5
Theory of Operation	6
Transmitter Servicing	13
Receiver Servicing	16
Multiple Frequency Modification Connections	21
Monitor-Intercom Connections	25
Test Set Log	27
10-, 30-, 45-Watt Transmitter Alignment Procedure	29
IDC Adjustment Procedure	31
1.5-Watt "Consolette" Base Station Alignment Procedure	32
Receiver Alignment Procedure (using TLD1770A Series RF Deck)	33
Receiver Alignment Procedure	35
RF Deck Circuit Board Detail	37
"Private-Line" Encoder and Decoder Circuit Board Detail	39
10/30-Watt & 45-Watt Power Amplifier Circuit Board Detail	40-41
Transmitter-Receiver Board Circuit Board Detail	43
Schematic & Intercabling Diagram and Parts List	46-47
1.5 Watt "Consolette" Base Station Partial Schematic Diagram	49
POWER SUPPLY	68P81010E89
Technical Characteristics	1
Description	1
Pre-Operational Connection and Adjustment	2
Circuit Operation	2
Maintenance	3
Schematic Diagram & Circuit Board Detail and Parts List	7

SECTION

SECTION OR PAGE NUMBER

ACCESSORIES

DC-ONLY CABLE KIT 68P81105E03
- Description 1
- Installation 1

MICROPHONE 68P81103E48
- Description 1
- Functional Operation 1
- Installation 2
- Operation 3
- Maintenance 3
- Reference Diagrams 5
- Desk Microphone Schematic and Circuit Board Detail 7

DC METER 68P81010E62
- Description 1
- Schematic Diagram and Parts List 3

VU METER 68P81010E63
- Description 1
- Adjustment 1
- Schematic Diagram, Circuit Board Detail and Parts List 3

ALERT TONE OSCILLATOR 68P81010E59
- Description 1
- Operation 1
- Schematic Diagram, Circuit Board Detail and Parts List 3

SINGLE-TONE ENCODER 68P81010E39
- Introduction 1
- Description 1
- Performance Specifications 2
- Adjustment 2
- Service 2
- Schematic Diagram, Circuit Board Detail and Parts List 3

MONITOR-INTERCOM 68P81010E96
- Description 1
- FCC Requirements 1
- Functional Circuit Description 2
- Adjustment 3
- Operation 3
- Functional Block Diagram 5
- Schematic Diagram, Circuit Board Detail and Parts List 7

PAGING CONVERSION KIT 68P81010E38
- Introduction 1
- Description 1
- Operation 1
- Schematic & Intercabling Diagram and Parts List 3

TIME-OUT TIMER 68P81010E68
- Description 1
- Operation 1
- Schematic Diagram, Circuit Board Detail and Parts List 3

SECTION	SECTION OR PAGE NUMBER
"CHANNEL-SCAN" MONITOR	68P81011E13
Description	1
Operating Instructions	1
Functional Operation	2
Two-Frequency Board Detail	7
Four-Frequency Board Detail	8
Interface Board Detail	9
Schematic Diagram and Parts List	12-13
Two-Frequency Board Circuit Board Detail	15
"Channel-Scan" Monitor Schematic Diagram	16-17
EMERGENCY POWER REVERTING KIT	68P81013E64
Description	1
Theory of Operation	1
Installation	2
General Battery Information	4
Maintenance	5
Schematic Diagram, Circuit Board Detail and Parts List	7
RF DECK	68P81010E98
Description	1
Theory of Operation	1
Maintenance	1
Schematic Diagram, Circuit Board Detail and Parts List	3

MOTOROLA

RADIO SET

MODEL CHART

CODE:

[X] = ONE INCLUDED

[4] = FOUR INCLUDED

NOTE
IDENTIFYING NUMBERS WHICH APPEAR ON EQUIPMENT AND IN THIS CHART DO NOT INCLUDED ACCESSORY ITEMS.

*INDICATED MODEL NUMBERS REPRESENT A SERIES. THE SPECIFIC NUMBER STAMPED ON THE CHASSIS CORRESPOND WITH SPECIFIC CARRIER-FREQUENCY RANGES. REFER TO THE TRANSMITTER-RECEIVER UNIT SCHEMATIC FOR A FURTHER BREAKDOWN OF THESE SERIES NUMBERS.

ITEM	DESCRIPTION	MODEL NUMBER	*L23BBB-1100BM	L33BBB-1100BM	L43BBB-1100BM	L43BBB-1190BM	L53BBB-1100BM	L53BBB-1190BM	L23BBB-3100BM	L33BBB-3100BM	L43BBB-3100BM	L43BBB-3190BM	L53BBB-3100BM	L53BBB-3190BM
		RF POWER OUTPUT	1.5 W	10 W	30 W	30 W	45 W	45 W	1.5 W	10 W	30 W	30 W	45 W	45 W
		NUMBER OF OPERATING FREQUENCIES CARRIER-SQUELCH MODELS	1	1	1	4	1	4						
		"PRIVATE-LINE" TONE-CODED SQUELCH							1	1	1	4	1	4
T: D1330BB	TRANSMITTER-RECEIVER UNIT, CARRIER-SQUELCH, 1.5 W; 1-FREQ.		X											
*TUD1270BB	TRANSMITTER-RECEIVER UNIT, CARRIER-SQUELCH, 10 & 30 W; 1-FREQ.			X		X								
*TUD1270BK	TRANSMITTER-RECEIVER UNIT, CARRIER-SQUELCH, 10 & 30 W; 4-FREQ.					X								
*TUD1280BB	TRANSMITTER-RECEIVER UNIT, "PRIVATE-LINE" TONE-CODED SQUELCH, 10 & 30 W; 1-FREQ.									X		X		
*TUD1280BK	TRANSMITTER-RECEIVER UNIT, "PRIVATE-LINE" TONE-CODED SQUELCH, 10 & 30 W; 4-FREQ.												X	
*TUD1290BB	TRANSMITTER-RECEIVER UNIT, CARRIER-SQUELCH, 45 W; 1-FREQ.						X							
*TUD1290BK	TRANSMITTER-RECEIVER UNIT, CARRIER-SQUELCH, 45 W; 4-FREQ.							X						
*TUD1300BB	TRANSMITTER-RECEIVER UNIT, "PRIVATE-LINE" TONE-CODED SQUELCH, 45 W; 1-FREQ.												X	
*TUD1300BK	TRANSMITTER-RECEIVER UNIT, "PRIVATE-LINE" TONE-CODED SQUELCH, 45 W; 4-FREQ.													X
TUD1340BB	TRANSMITTER-RECEIVER UNIT, "PRIVATE-LINE" TONE-CODED SQUELCH, 1.5 W; 1-FREQ.								X					
TLN4403A	PANEL & CHASSIS KIT		X	X	X	X	X	X	X	X	X	X	X	X
TPN1084A	POWER SUPPLY		X	X	X	X	X	X	X	X	X	X	X	X
THN6120A	HOUSING KIT		X	X	X	X	X	X	X	X	X	X	X	X
TLN4413A	MULTI-FREQUENCY SWITCH KIT					X		X	X			X		X
TLN4414A	"PRIVATE-LINE" SWITCH KIT								X	X	X	X	X	X
TLN6824A	"VIBRASENDER" RESONANT REED								X	X	X	X	X	X
TLN8381A	"VIBRASPONDER" RESONANT REED								X	X	X	X	X	X
TMN1004A	DESK MICROPHONE, CARRIER-SQUELCH		X	X	X	X	X	X						
TMN1005A	DESK MICROPHONE, "PRIVATE-LINE"								X	X	X	X	X	X
K1017A	TRANSMITTER RESONATOR		X	X	X	4	X	4	X	X	X	4	X	4
K1056A	RECEIVER RESONATOR		X	X	X	4	X	4	X	X	X	4	X	4
TLN4657A	TUNING-TOOL KIT		X	X	X	X	X	X	X	X	X	X	X	X

EPS-11192-A

1. INTRODUCTION

The Motorola solid-state "Consolette" base station is a compact 1.5-, 10-, 30-, or 45-watt rf output FM two-way radio used primarily for local control operation in the 136-174 MHz band. The station is designed for desk or table top installation and fully utilizes the advantages of solid-state circuits - reliability, small size, ruggedness and low maintenance requirements. Contained within the compact steel cabinet is an easily removable transmitter-receiver unit, ac operated power supply and control panel which contains all controls necessary for local operation of the station. The rear of the cabinet is equipped with an antenna connector, terminal boards for external connections and a key lock. Efficient heat radiators to ensure safe operating temperatures for the transmitter power amplifier stages and the power supply regulator transistors extend from the rear of the cabinet.

Solid-state "Consolette" base stations are available in a variety of models as shown in the model chart at the front of this manual. These include carrier squelch, "Private-Line" tone-coded squelch, and single- or multiple-frequency models.

The station cabinet facilitates ease of maintenance and is easily removed from the chassis assembly by unlocking the key lock and loosening two thumb-screws at the rear of the cabinet. All external connections (except primary power) are made at terminal boards at the rear of the chassis and need not be disturbed for removal of the cabinet. The transmitter-receiver chassis is secured to the main chassis assembly by four quick-release snap fasteners. When these are released, the transmitter-receiver unit may be readily removed for maintenance or quick access to optional kits.

2. BASIC TYPES OF STATIONS

a. Carrier Squelch Models

These models are used when all transmissions on a specific frequency are to be heard. The receivers incorporate a noise-actuated squelch circuit consisting of a noise limiter, a noise detector and a dc control stage (switching circuit) to cut off the 1st audio amplifier. This eliminates disturbing noise which would otherwise be heard at the speaker during intervals between received messages.

b. "Private-Line" Tone-Coded Squelch Models

This type of station is an improvement in FM two-way radio equipment, especially when operating under crowded channel conditions. Several "Private-Line" systems can use the same rf carrier frequency in the same area if each system uses a different "Private-Line" tone frequency.

The transmitters are modulated by a continuous sub-audible tone signal in addition to the voice modulation. The receivers accept only correctly tone-modulated signals when the "PL" ON-OFF switch is in the ON position, and reject all others.

"Private-Line" tone-coded squelch models also include noise-actuated squelch circuitry as previously described for carrier squelch models. This enables the operator to monitor the channel before transmissions ("PL" ON-OFF switch in OFF position) to prevent interference with other

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users of the frequency. The Model TMN1005A Desk Microphone, supplied with PL stations, has a "Private-Line" disable switch to permit switching to the noise-actuated squelch circuit for monitoring before transmitting.

The SQUELCH control has no effect on PL squelch sensitivity. In normal operation ("PL" ON) the receiver audio is activated when the on-frequency rf signal is FM modulated by the proper sub-audible PL tone to activate the "Private-Line" decoder.

3. CONTROL FACILITIES

The following three modes of operation are possible with the station:

a. Local Control Operation

The station will normally be operated in the local control mode using a TMN1004A or TMN1005A Desk Stand Microphone. All necessary controls are mounted on the base station control panel.

b. Extended Local Control Option

In this mode of operation, a telephone-type desk set is connected to the station via a control cable which is available in lengths up to 100 feet. The station may be controlled either at the control panel or from the desk set. Extended local control operation can be used in several configurations which are shown later in this section of the manual.

c. Remote Control Option

The remote control option necessitates the use of a remote control adapter and a remote control console. The remote control console is located at a point distant (over 100 feet) from the station. Control of the station is accomplished by applying various dc line currents to the remote control adapter via the control line from the remote control console.

4. DESCRIPTION OF ITEMS

a. Transmitter-Receiver Unit

(1) Carrier Squelch Receiver

The receiver used in the station is a crystal controlled, dual conversion superheterodyne model providing five watts of audio output. Single and multiple frequency models are available using plug-in crystals to provide stable frequency control. Maximum channel spacing between the lowest and highest frequencies without degradation of performance is approximately 250 kHz.

The receiver is completely transistorized employing up to 33 transistors and utilizing printed circuit modular construct on throughout. Highly selective L-C tuned circuits in the receiver rf deck and a sealed, life-time guaranteed "Permakay"® filter in the 2nd i-f stage determine the excellent bandwidth and selectivity characteristics of the receiver. Audio detection and amplification is achieved in a phase discriminator and three audio amplifier stages. Noise cancellation is effected by an efficient noise-operated squelch circuit with adjustable sensitivity.

(2) "Private-Line" Receivers

"Private-Line" receivers are identical to carrier squelch models except that they incorporate two types of squelch circuits (noise-operated and tone-operated) as described previously.

(3) Transmitter

The 30- or 45-watt rf transmitter is completely transistorized and uses unheated crystals, permitting instantaneous on-frequency transmission over an ambient temperature range of -30°C to +60°C. Single or multiple frequency operation is achieved by the use of one or more oscillator-modulator-multiplier stages in the transmitter exciter. Maximum channel separation between the lowest and highest frequencies without degradation of performance is approximately 500 kHz. A buffer stage, frequency tripler and amplifier stage complete the rf section of the exciter. The audio section consists of an audio amplifier, "Instantaneous Deviation Control" (IDC) limiter and isolation amplifier. Direct modulation is effected in the oscillator-modulator-multiplier stage(s). The output of the exciter at

nine times the crystal frequency is applied to the power amplifier through the bandpass filter. The power amplifier consists of a 2nd amplifier, driver stage, and push-pull final amplifier (10-watt and 30-watt models). In 45-watt models, an additional pre-driver stage is used. In 1.5 watt models, a single amplifier stage is used. A high level of spurious frequency attenuation is achieved by the four section harmonic filter in the transmitter output.

b. Power Supply

The 120-volt, 60-Hz (or optional accessory 120-, 220-, 240-volt 50/60 Hz) power supply is a fully regulated unit providing all necessary dc voltages for operation of the station and its optional accessories. The power supply consists of a power transformer, full-wave bridge rectifier, transistor series regulator and associated control circuits assembled in to a compact chassis. A plug-in cable connects the power supply to the station control panel and transmitter-receiver unit. To ensure safe operating temperatures for the regulator transistors, an efficient heat radiator is provided on the rear of the chassis. AC line protection is provided by a fuse located below the heat radiator and is accessible from the rear of the station. Maintenance is facilitated through easy removal of the complete power supply chassis from the main chassis assembly of the base station.

c. Control Panel

The basic control panel consists of a combined volume control and power on-off switch, power on and transmit indicator lamps, receiver squelch control, a frequency selector switch (multi-frequency models only), a "PL" ON-OFF switch ("Private-Line" tone-coded squelch models only) and the station speaker. Various optional accessories are available for installation on the control panel.

5. TYPICAL SYSTEM APPLICATIONS

The base station radio, used with its many accessories, features a wide latitude of versatility. Items may be added as required to extend the function of the station to accommodate particular requirements. This section describes just a few of the typical system applications to which the base station may be adapted.

a. System 1
(Refer to Figure 1)

This system is the basic radio installed on a desk top, and using a microphone at the desk position for locally controlling the radio. The radio location is the operating position and the control point for the system. A basic model radio is used for this purpose

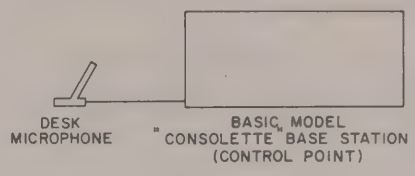
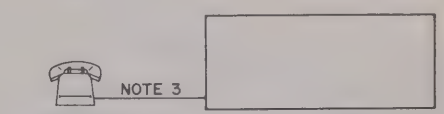


Figure 1.

b. System 2
(Refer to Figure 2)

This system provides operation of the radio in an extended local mode in those cases where the radio cannot be located on the desk top. In such a system the radio is placed within 100 feet of the operating position and controlled by a Motorola desk set. The desk set is connected to the radio via a cable and becomes the control point it also contains the necessary "transmitter-on" light. The equipment required for such a system is: (1)basic model radio less microphone,(2) desk set, (3)interconnecting cable kit and (4)wall mount brackets for the radio (optional).



NOTES:
1. NO MICROPHONE USED IN THIS SYSTEM.
2. WALL MOUNT AVAILABLE AS OPTION.
3. MAXIMUM CABLE LENGTH TO DESK SET: 100 FEET.
4. REMOVE JUMPER (INTERNAL) ACROSS TB2-7 & 8. (TO DISABLE SPEAKER IN UNIT.)

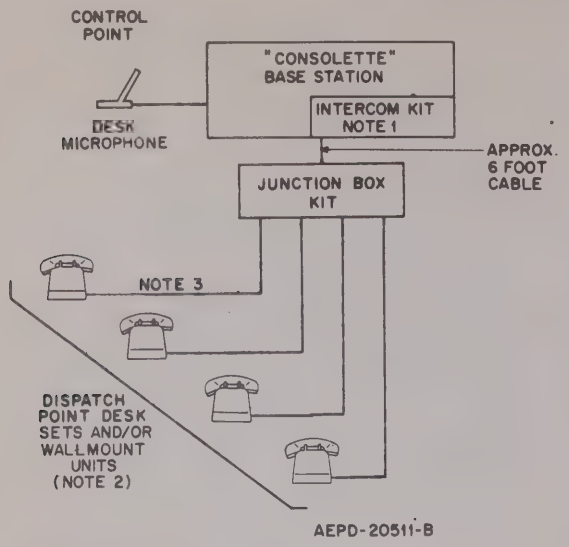
Figure 2.

c. System 3
(Refer to Figure 3)

This system has one control point with desk set extensions to other positions which may serve as dispatch points. The radio position is the control point and has complete supervision over transmissions from the desk sets. Transmitted audio is monitored at all points except the point

sending the message. In addition, all dispatch points may communicate with one another and with the control point without activating the radio transmitter by using an intercom kit (installed in the station). The system incorporates a priority feature which causes any on-frequency radio message to have priority over any intercommunication taking place between the desk sets or control point.

The following items are required for installing this type of a system: (1)a station intercom kit, (2)a junction box kit, (see installation section), (3)desk sets as required, (4)desk set cabling (up to 100 ft. from control point to each desk set).

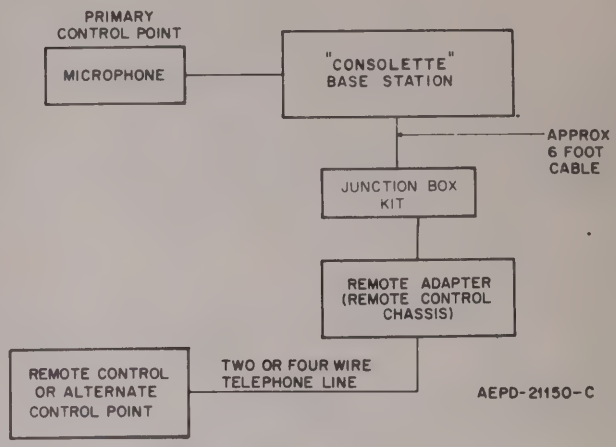


NOTES:
1. WHEN DISPATCH POINTS ARE USED, AN INTERCOM KIT MUST BE INSTALLED.
2. UP TO A COMBINED TOTAL OF SIX DISPATCH POINTS MAY BE USED.
3. MAXIMUM CABLE LENGTHS TO DISPATCH POINTS: 100 FEET.

Figure 3.

d. System 4
(Refer to Figure 4)

This system provides for those who may want to license two control points for operation at a place of business during the day (primary control point) and transfer of the operation to a home during the evening (alternate control point). Operation of the radio system may be accomplished from only one or the other of the control points at a given time. A switch is provided in the junction box kit which permits transfer of the control point. This protects the location not in use from being operated by unauthorized personnel when that location is unattended. The equipment for this system consists of: (1)basic model station with microphone, (2) a remote adapter, (3) a junction box kit, and (4) a dc remote control desk set or a dc remote control console.

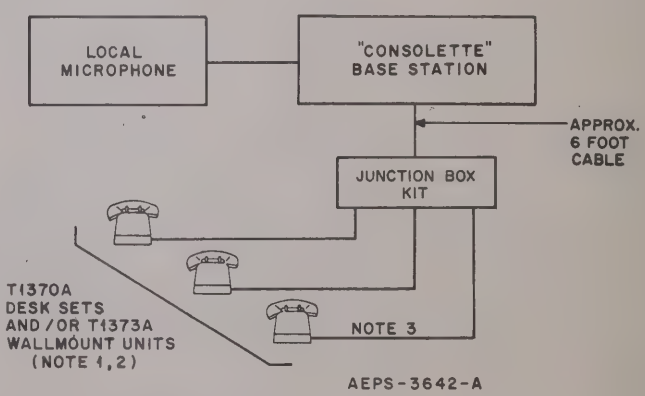


DC REMOTE CONTROL CONSOLE OR DC REMOTE CONTROL DESK SET.

Figure 4.

e. System 5
(Refer to Figure 5)

This system provides for use of up to six local control units without an intercom kit. In this system, each local control unit must be licensed by the FCC as a control point as none of the units can monitor the transmit audio of any of the other units. Intercommunication between units or with radio equipment is not possible. (All units can monitor only receiver audio.) Equipment required for this system is: (1) basic model station (local microphone is optional), (2)a junction box kit, and (3)local control units and cable kits as desired.

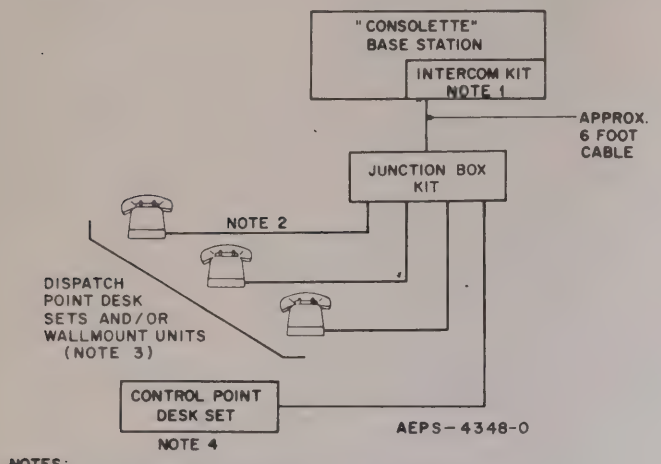


NOTES:
1. UP TO A COMBINED TOTAL OF SIX DESK SETS AND/OR WALLMOUNT UNITS MAY BE USED.
2. EACH UNIT MUST BE LICENSED AS A CONTROL POINT.
3. MAXIMUM CABLE LENGTHS OF 100 FEET.

Figure 5.

f. System 6
(Refer to Figure 6)

This system enables a desk set to become the control point for the system with the radio located remotely or wall-mounted (option). The control point desk set includes a switch to disable all dispatch points from controlling the transmitter. Equipment required for this system is (1) base station with intercom kit, (2)local control units as required for dispatch points, (3)control point desk set, (4)up to 100 feet of cabling from each desk set to the station location, and (5)a junction box kit.



NOTES:
1. WHEN DISPATCH POINTS ARE USED, AN INTERCOM KIT MUST BE INSTALLED. REFER TO APPLICABLE MANUAL FOR MONITOR KIT MODEL NUMBER.
2. MAXIMUM CABLE LENGTHS TO DESK SETS: 100 FEET.
3. MAXIMUM OF SIX DISPATCH POINTS MAY BE USED.
4. A SUPERVISORY DESK SET AT THE CONTROL POINT MUST BE USED.

Figure 6.

6. LOCAL CONTROL STATION FUNCTIONAL DESCRIPTION

a. Power Application

The overall operation of carrier squelch and "Private-Line" tone-coded squelch base stations is illustrated in Figure 7. Primary input voltage is connected to the station power supply through the line cord. When the on-off switch (part of the OFF-VOLUME control) is turned on, the power supply is activated and the green (power on) indicator lamp on the control panel lights.

The dc output from the power supply is applied to the transmitter-receiver as follows:

(1) The high current A+ line to operate the transmitter high power stages is routed to the transmitter via the power control cable connector and transmit-receive relay.

(2) The low current A+ line for the receiver and low level transmitter exciter stages as well as transmitter keying voltage is routed through a second set of contacts on the power on-off switch (part of VOLUME control) to the transmitter-receiver and applied to the following circuits:

(a) The entire receiver.

(b) The transmitter audio amplifier.

(c) The PL encoder-decoder, and time delay circuits (in "Private-Line" models only).

A regulated 9.1-volt supply (referenced to chassis) derived from the receiver filtered A+ voltage is applied to:

1. Both the transmitter and receiver oscillators.

2. The transmitter IDC circuit.

3. The PL tone generator (in "Private-Line" models only).

4. The time-out-timer (if used).

5. The receiver multiplier and rf deck.(TLD8370A series rf deck only).

b. Transmit Operation

When the power on-off switch is turned on, the transmitter is immediately ready for operation. When the push-to-talk switch on the microphone is pressed, the following functions are performed:

(1) The red (transmit) indicator lamp on the control panel lights.

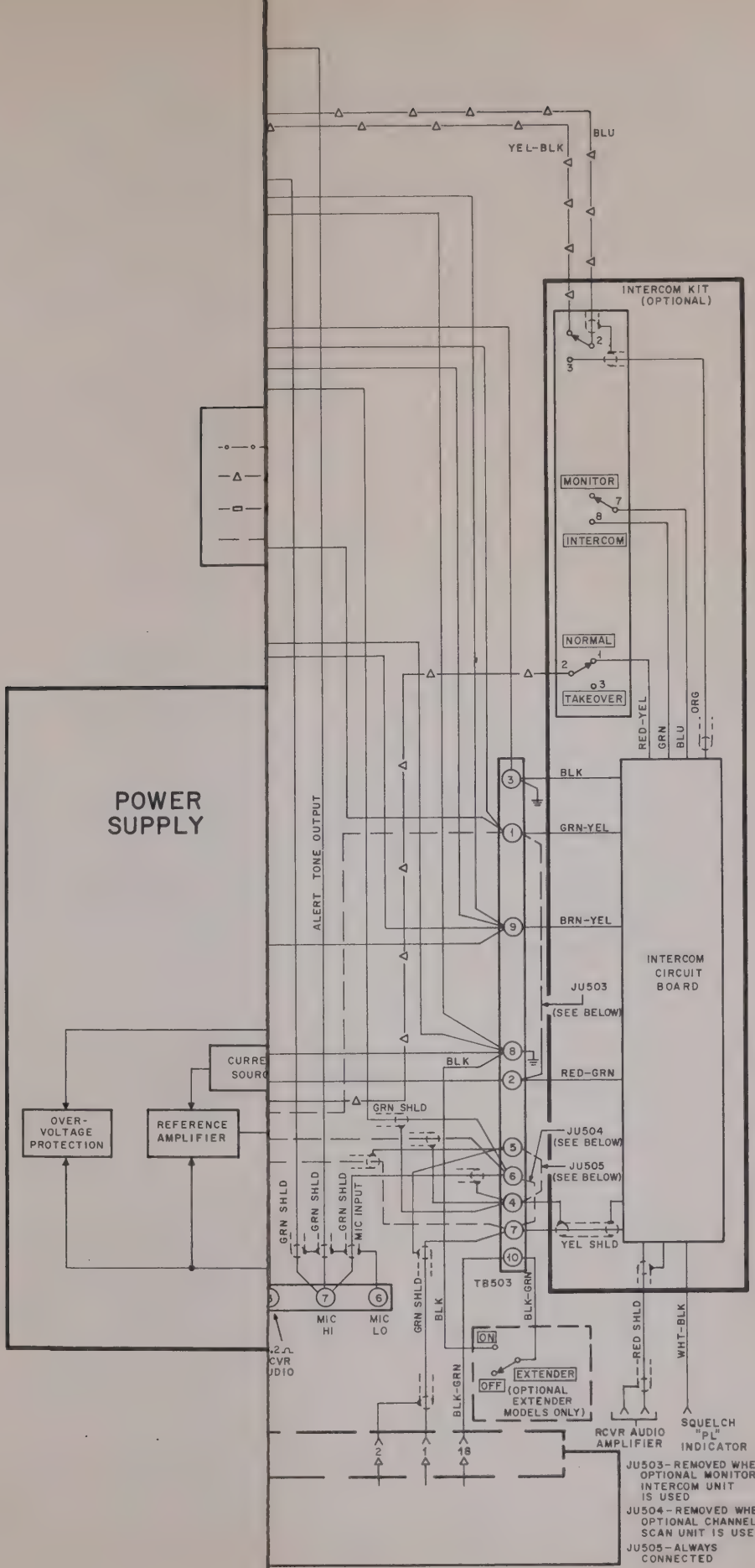
(2) The transmit-receive relay is energized. (In "Private-Line" models, the push-to-talk switch activates the PL time delay circuit, which in turn energizes the relay.) The relay performs the following switching functions:

(a) The antenna is switched from the receiver to the transmitter.

(b) Filtered A+ is switched from the receiver to the low level transmitter exciter stages.

(c) Regulated A+ is provided to operate the high power transmitter stages.

(d) Regulated 9.1 V is removed from the receiver oscillator and multipliers to turn them off.


BLU
YEL-BLK
INTERCOM KIT
(OPTIONAL)
MONITOR
INTERCOM
NORMAL
TAKEOVER
RED-YEL
GRN
BLU
ORG
POWER
SUPPLY
ALERT TONE OUTPUT
BLK
GRN-YEL
BRN-YEL
INTERCOM
CIRCUIT
BOARD
JU503
(SEE BELOW)
BLK
RED-GRN
GRN SHLD
JU504
(SEE BELOW)
JU505
(SEE BELOW)
YEL SHLD
OVER-
VOLTAGE
PROTECTION
REFERENCE
AMPLIFIER
GRN SHLD
GRN SHLD
GRN SHLD
MIC INPUT
TB503
MIC
HI
MIC
LO
GRN SHLD
BLK
BLK-GRN
ON
OFF
EXTENDER
(OPTIONAL
EXTENDER
MODELS ONLY)
BLK-GRN
RED SHLD
WHT-BLK
RCVR AUDIO
AMPLIFIER
SQUELCH
"PL"
INDICATOR
JU503- REMOVED WHEN
OPTIONAL MONITOR-
INTERCOM UNIT
IS USED
JU504- REMOVED WHEN
OPTIONAL CHANNEL
SCAN UNIT IS USED
JU505- ALWAYS
CONNECTED

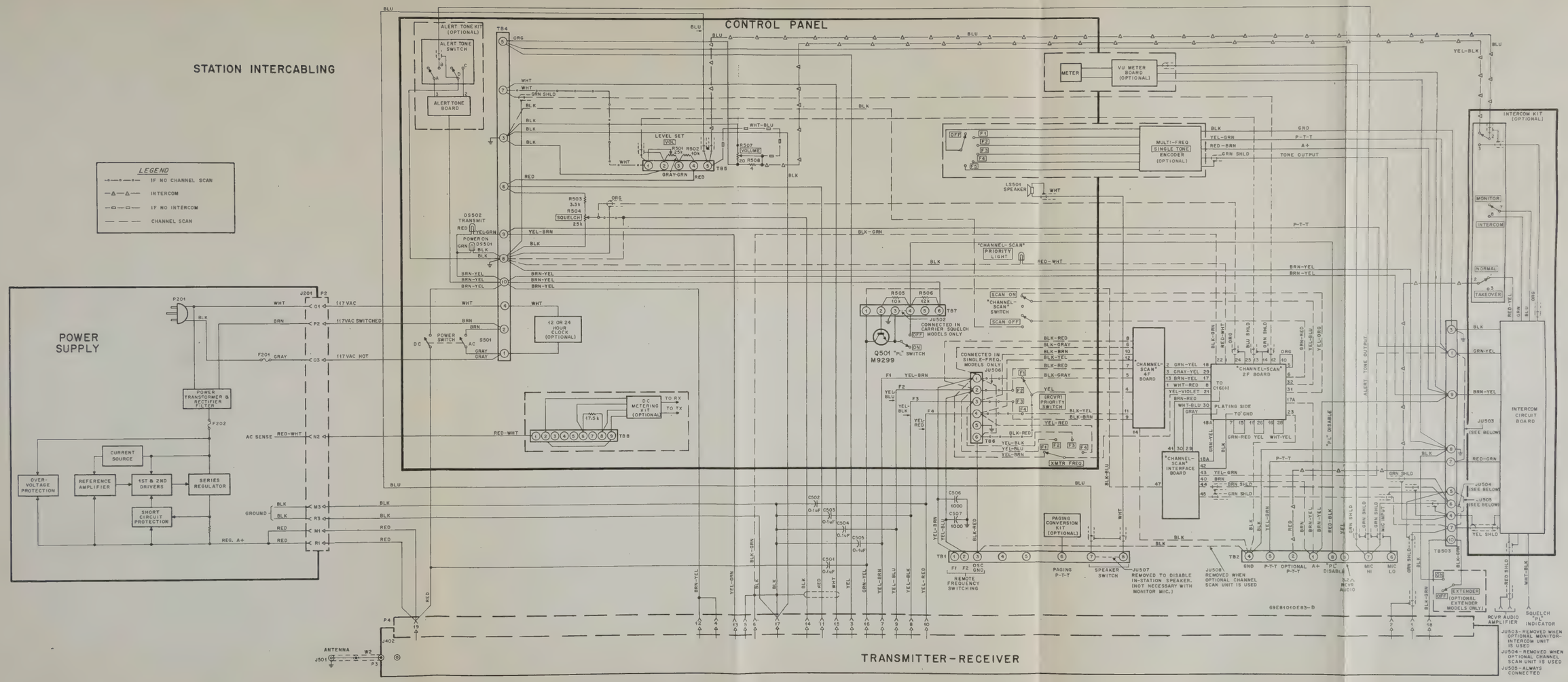


Figure 7.
Intercabling Diagram

DESCRIPTION

When the push-to-talk switch is released, the following takes place:

(1) Carrier Squelch Models

(a) The red (transmit) indicator lamp on the control panel goes out.

(b) The transmit-receive relay is deactivated, removing A+ from all transmitter rf stages and applying filtered A+ to the receiver, as well as 9.1 V to the receiver oscillator and multipliers. The antenna is switched from the transmitter to the receiver.

(2) "Private-Line" Tone-Coded Squelch Models

(a) The red (transmit) indicator lamp on the control panel goes out.

(b) The regulated A+ voltage to the "Private-Line" tone generator is removed, causing a phase reversal of the tone output signal fed to the transmitter modulator.

(c) The path to the push-to-talk bridge is opened, but the "Private-Line" delay circuitry keeps the transmitter on for approximately 150 milliseconds after the release of the push-to-talk switch. During this time, the "Private-Line" tone reverse burst is transmitted and damps the vibration of the "Vibrasponder" resonant reed in the listening receiver, thus returning it to a squelched condition.

(d) After the 150 millisecond delay, the transmit-receive relay is deactivated. This removes all A+ voltage from the transmitter and the station reverts to receive operation.

c. Frequency Selection
(Multi-Frequency Models only)

Multi-frequency stations incorporate up to eight oscillator circuits (four for receive and four for transmit). The appropriate transmit and receive oscillator is activated when its ground path is completed by the frequency selector on the control panel.

d. "Private-Line" Disable
("Private-Line" Tone-Coded Squelch Models only)

When the "Private-Line" switch on the control panel is placed in the OFF position, a ground is removed from the receiver audio switch circuit permitting the noise-operated squelch circuit to operate. All on-frequency signals with or without "Private-Line" tone coding will now be heard.

7. REQUIRED ACCESSORY

The solid-state "Consolette" base radio is sold as a complete, ready-to-use station (less antenna). The type of antenna required depends on local operating conditions and should be determined by a qualified communications representative. Contact your local Motorola radio communications representative for your antenna selection and ordering needs.

8. OPTIONAL ACCESSORIES

The majority of the following accessories are available as factory installed options in new stations. Many of these accessories are also "add-to" items for field installation. Other accessories are not installed in the station, but are used externally in conjunction with the station. Complete installation and operating instructions are included with each "add-to" kit. Other accessories may become available after the printing of this manual. Also, other accessories are available which have more special application than those listed here. See you local Motorola representative for complete details on all "add-to" accessories.

Certain accessories cannot be added if the station is already equipped with another accessory. For example, dc metering cannot be added if the station is already equipped with a vu meter. The accompanying chart defines restrictions on adding accessories.

a. TLN4420A DC Meter

The meter is available for local control stations and provides metering of the transmitter and receiver circuitry directly from the control panel. A 0-50 microampere meter and an eighteen-position rotary switch are used for metering The meter and switch permit measurement and selection of critical test points in all receiver and transmitter circuits. Specific circuits to be measured are connected to the meter via receptacles on the receiver and transmitter chassis. The meter is mounted on the front panel and is held in place by a clip which is supplied with the meter kit. The rotary switch is mounted on the control panel frame which is in turn fastened to the front panel.

OPTIONAL ACCESSORY COMPATIBILITY CHART

Option	DC Meter	VU Meter	"Single-Tone" Encoder	"Single-Tone" Encoder (Non-Standard Frequencies)	Alert Tone Oscillator	"Channel-Scan" Monitor
DC Meter	--	NO	YES	YES	YES	NO
VU Meter	NO	--	YES	YES	YES	YES
"Single-Tone" Encoder	YES	YES	--	--	NO	NO
"Single-Tone" Encoder (non-standard frequencies)	YES	YES	--	--	NO	NO
Alert Tone Oscillator	YES	YES	NO	NO	--	NO
"Channel-Scan" Monitor (Multi-freq. models only)	NO	YES	NO	NO	NO	--
Clock: 12 hr. 60 Hz / 24 hr. 60 Hz / 12 hr. 50 Hz / 24 hr. 50 Hz	All AC Models (Use only 1 clock)					
Time-Out Timer	All Models					
Emergency Power Reverting Kit	All Models					
Wall or Rack Mount Kit	All Models					
DC Only Operation Kit	All Models					
Monitor-Intercom	All Models					
Rcvr RF Deck (for improved sensitivity)	All Models					
PL Station Paging Conversion Kit	PL Models Only					
Remote Control Adapter	Single Frequency Models Only					

b. TLN1368A VU Meter

The vu meter provides a relative indication of the speech level input to the transmitter exciter audio circuits from a microphone or remote control line. The kit consists of a vu meter which mounts on the control panel of the station and a circuit board which mounts beneath the transmitter-receiver chassis assembly. A variable attenuator on the circuit board is used to set the vu meter reading for a specific audio input level.

c. TLN1371A (Standard Frequencies) and TLN1371AV (Non-standard Frequencies) "Single-Tone" Encoders

The transistorized multiple-frequency "Single-Tone" encoder is a selective tone source for the base station in a "Single-Tone" controlled two-way radio communication system. It permits base-to-mobile selective calling, or provides remote switching functions for control of standby equipment. Up to five fixed-frequency tones may be individually selected by a rotary switch. Jumper connections provide optional tone durations from 0.5 seconds to 1.5 seconds, or a continuous tone for test purposes.

The encoder may be used to tone-alert a receiving station to a pertinent incoming call, or the associated receiver may incorporate a tone decoder unit to complete the audio output circuit. Thus, only the receiver for which the call was intended will receive the message. A tone-decoder equipped receiver can also energize an external control circuit for repeater or alarm systems.

d. TLN1369A Alert Tone Oscillator

The alert-tone oscillator provides a 1000-Hz tone that can be used as an alerting signal prior

to actual voice transmission, or as a test tone when adjusting the deviation of a transmitter. The kit consists of a transistorized oscillator, a switch, the cabling required for circuit interconnections and the hardware for mounting to the control panel.

e. TLN1372A "Channel-Scan" Monitor

The Motorola "Channel-Scan" monitor is used with multi-frequency models only. It provides sequential scanning of four receiver frequencies. When a signal is received on one of the scanned channels, the audio is heard on the radio speaker. If this signal is not the priority channel, the unit continues to sample the priority carrier. If a signal is detected on the priority channel, the receiver will stop scanning and lock on the priority channel for as long as the carrier is received. This assures that the operator can monitor a message on any one of the channels which his radio can receive, without missing any messages on the priority channel. An indicator lamp is provided on the front panel which lights when the priority channel is being received.

f. Clocks

Clocks are available in 12-hour and 24-hour, 50-Hz and 60-Hz versions. All are of the cyclometer type, and mount in the control panel of the station.

MODEL	DESCRIPTION
TLN4417A	12-Hr., 120 V ac 60 Hz
TLN4418A	24-Hr., 120 V ac 60 Hz
TLN4429A	12-Hr., 120 V ac 50 Hz
TLN4430A	24-Hr., 120 V ac 50 Hz

g. Time-Out Timer

The Motorola time-out timer is a "supervisory" device designed to turn off the base station transmitter after approximately one minute of continuous transmission. In addition, it provides an alert tone to the receiver audio circuit to signal the operator that the transmitter is no longer on-the-air. The time-out timer is reset when the push-to-talk switch is released, permitting transmission to be resumed for another minute. The kit consists of the TLN1097A plug-in Time-Out Timer module and a TLN4323A Adapter Kit (includes a circuit board) on which the time-out timer is installed. A cable connects the circuit board to the appropriate circuits of the radio.

h. TLN1374A Emergency Power Reverting Kit

This kit is an adapter cable which permits operation of the base station from either a 120-volt ac primary power source or a 12-volt dc power source. The emergency power reverting kit is used in applications where communications must remain operational during ac power failures. In the event of a 120-volt ac power failure, instantaneous automatic switchover to battery operation is provided. Operation on emergency power is indicated by the green power on indicator blinking. Included in the kit is a full time trickle charging circuit for the standby 12-volt battery.

i. TLN4546A DC Only Kit

This kit consists of an adapter cable which permits operation of the station from a 12-volt dc power source instead of the regular power supply.

j. TLN4427A Wall or Rack Mount Kit

This kit is available for use with all models of the "Consolette" base stations. The station may be mounted in any 19-inch rack, or attached to a wall panel with this kit. When mounted, the base station is vertically oriented and is operated in the extended local or remote control mode.

k. TLN1370A Monitor-Intercom

This kit permits intercommunication between the base station and a remote control console, between the base station and a desk set, or between two or more desk sets connected in parallel with the base station, without keying the transmitter. The kit consists of a transistorized amplifier, a cable for circuit interconnections, mounting hardware, and the takeover and intercom switch (to be mounted on the front panel). The intercom also has a "squelch-priority" feature which disables the intercom anytime an on-frequency carrier is received by the base station receiver.

When Motorola desk sets are used with the station, the speaker pad on the station permits independent audio level control at the control panel and desk set or remote control console speaker(s).

l. TLD8370A Series RF Deck

This rf deck improves receiver sensitivity to .35 microvolts or better for 20 dB quieting sensitivity, while only slightly lowering intermodulation protection. The rf deck is on a printed circuit board and mounts in the same location as the normally-supplied rf deck in the transmitter-receiver unit.

m. TLN1373A PL Station Paging Conversion Kit

The paging conversion kit is used to adapt a "Private-Line" base station for use in a selective-paging system. The kit permits operation of the transmitter without "Private-Line" tone modulation so that paging tones from a selective paging encoder may be transmitted when desired. The transmitter may also be operated in the "Private-Line" mode when transmissions without selective paging tones are desired. The kit consists of a relay, printed circuit board, mounting bracket and interconnecting cable.

n. TLN1126A Remote Control Adapter (Single-Frequency "Private-Line" Tone-Coded Squelch Stations)

This remote-control adapter permits remote control of a "Private-Line" tone-coded squelch station via a two- or four-wire audio/control line. The unit contains relays, a line matching transformer and a "Private-Line" disabling feature on a small, compact chassis. The adapter is used with a Motorola DC Remote Control Console, a DC Remote Control Desk Set, or their equivalents.

o. TLN1127A Remote-Control Adapter (Single-Frequency, Carrier Squelch Stations)

This remote-control adapter permits remote control of a carrier squelch station via a two- or four-wire audio/control line. The unit contains relays and a line matching transformer on a small, compact chassis. They are used with a Motorola DC Remote-Control Console, a DC Remote-Control Desk Set, or their equivalents.

p. T1251B "Quik-Call" Console

The Motorola "Quik-Call" console is a completely self-contained desk-top unit used to originate coded tone signals for use in a Motorola selective signalling system or equivalent.

Used with the station, the console provides a fast and accurate means of selectively calling another station located within a radio system without using air time to set up the call. Using this unique system, the speaker at the reception point is silent until called via the coded tone signal on a specific carrier frequency. Each coded signal is transmitted during the first two to three seconds of the initial transmission to the called station. Thus, the receiver being called is changed from standby to operating condition almost immediately. This silent standby condition relieves the operator of listening to all the interference and chatter on the channel in order to receive pertinent messages.

q. Selective Paging Equipment

These encoders are used with the "Consolette" base station to selectively alert or page persons carrying either Motorola "Pageboy" radio pagers "Handi-Talkie" ® radio pagers, or selective "Handi-Talkie" FM two-way radios. The paging encoder generates paging tones which are transmitted by the base station equipment to alert the desired person. If the receiver is equipped for reception of voice messages, the encoder operator can transmit a voice message once the receiver has been alerted. Persons carrying units not equipped for voice reception follow a predetermined course of action, such as calling a specific telephone number upon hearing the alerting tone.

(1) N1016B-N1019B Selective Paging Equipment

Up to 20 different pairs of paging tones are available from this encoder, which are used to modulate the station transmitter. In this manner, up to 20 individual radio units may be selectively paged using one of these encoders.

This encoder is available in four different models, which are identical except for the paging capacity of each. The N1016B Model is a 2-call unit, the N1017B Model is a 6-call unit, the N1018B Model is a 12-call unit, and the N1019B Model is a 20-call unit.

(2) L08ENC-Series High-Capacity Paging Encoders

Modular construction of these units allow easy expansion from the basic 90-call capacity to either 210-, 380-, 600-, or 870-call capacity simply by plugging in modular circuit boards. Two encoders can be combined to give a 1740-call capacity.

r. T1370A Desk Set (Extended Local Control)

This desk set consists of a desk-type telephone set with a built-in speaker, a dynamic microphone cartridge containing a transistorized preamplifier, a rubber-covered coil cord, and an indicator light which illuminates when this or a parallel-connected desk set is keying the transmitter. The desk set contains a power supply which operates from a 120-volt ac source to power the indicator lamp and its circuits. This desk set may be used with carrier squelch or with "Private-Line" tone-coded squelch models.

INSTALLATION AND OPERATION

IMPORTANT

FCC regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class commercial radiotelephone operator's license or by personnel working under their immediate supervision.

2. The rf power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and local conditions.

3. Frequency, deviation and power of a base station transmitter must be checked before it is placed in service and rechecked every year thereafter.

REMEMBER

The efficiency of the equipment depends upon a good installation.

1. INSPECTION

Inspect the equipment thoroughly as soon as possible after delivery. If any part of the equipment has been damaged in transit, report the extent of damage to the transportation company immediately.

2. ANTENNA AND TRANSMISSION LINE CONSIDERATIONS

The antenna and transmission line kit are not included with the base station since each installation requires special attention. Consult your nearest Motorola representative for antenna and transmission line requirements. Installation of of the antenna should be made prior to the installation of the base station. Follow the instructions included with the antenna and transmission line kits.

3. INSTALLATION OF CABINET

a. Unpacking

(1) Follow unpacking instructions printed on the inside flap of the packing carton.

(2) Remove the foam blocks from either side of the station cabinet.

(3) Remove the envelope containing the keys from the front panel.

(4) Remove the accessories from the shipping carton.

b. Location

The cabinet should be located on a solid, level surface convenient to the ac power source and the transmission line. Allow space for ventilation at the sides and rear of the cabinet. The transmission line should be kept as short as possible to minimize line losses.

The cabinet of the local control model base station should be located at a level where the controls on the panel are convenient to the operator.

c. "Consolette" Station Terminal Functions

Terminal function identification is given in the following chart.

MOTOROLA INC. Communications Division
ENGINEERING PUBLICATIONS 1301 E. ALGONQUIN ROAD SCHAUMBURG, ILLINOIS 60172

FUNCTION	"CONSOLETTE" STATION TERMINAL NUMBER
Auxilary A+ Out	TB2-1
Desk Set P-T-T	TB2-2
3.2-Ohm Audio Hi*	TB2-3
Ground	TB2-4
Mic P-T-T	TB2-5
Mic Lo or Intercom Audio Shield*	TB2-6
Mic Hi or Intercom Audio Hi*	TB2-7
PL Disable	TB2-8
F1 Remote Frequency Switching	TB1-1

FUNCTION	"CONSOLETTE" STATION TERMINAL NUMBER
F2 Remote Frequency Switching	TB1-2
Oscillator Ground	TB1-3
Paging Option P-T-T	TB1-6
3.2-Ohm Audio Hi	TB1-7
3.2-Ohm Audio Mute	TB1-8

*Local or remote option only

d. Microphone Connection

Connect the microphone as shown in the following chart.

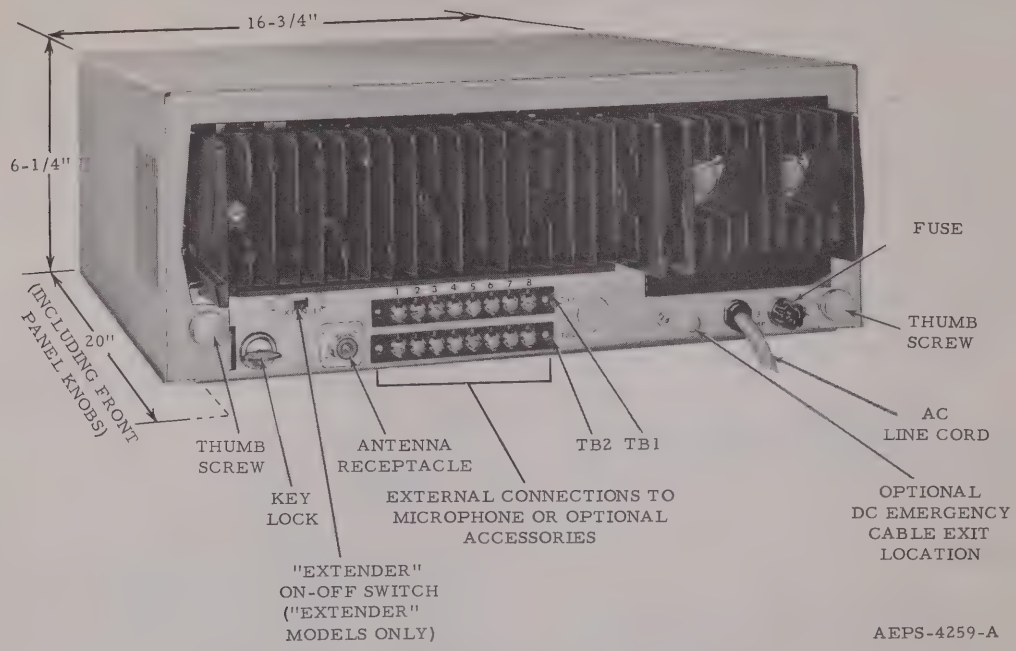


Figure 1. Connection Locations

FUNCTION	MICROPHONE WIRE COLOR		CONNECT TO "CONSOLETTE" STATION TERMINAL NO.
	TMN1000A* or TMN1004A	TMN1001A* or TMN1005A ("PL" MODEL)	
GND	BLK	BLK	TB2-4
P-T-T	GRN	GRN	TB2-5
MIC-LO	SHLD	SHLD	TB2-6
MIC-HI	BRN	BRN	TB2-7
"PL" DISABLE	WHT	WHT	TB2-8
3-OHM AUDIO HI	YEL	YEL	TB1-7
3-OHM AUDIO MUTE	RED	RED	TB1-8

*Suffix -1 or later; models only; these particular models are no longer available; they have been replaced by the TMN1004A and TMN1005A Models.

e. Desk Set Connection

When using a desk set and no local microphone with the "Consolette" base station, remove the jumper between TB1-7 and -8. This disables the station speaker.

T1370A AND T1373A LOCAL CONTROL UNIT CONNECTIONS

SINGLE CONTROL UNIT USED WITH "CONSOLETTE" STATION WITHOUT INTERCOM KIT		
CONTROL UNIT TB#	FUNCTION	CONSOLETTE TB#
T1	Desk Set Mic Hi	TB2-7
T4	Desk Set Mic Lo	TB2-6
T2	Desk Set P-T-T	TB2-5
T7	Ground	TB2-4
T6	3-Ohm Audio Hi	TB2-3
T8	PL Disable	TB2-8
T9*	A+	TB2-1

MULTIPLE CONTROL UNITS USED WITH "CONSOLETTE" STATION WITH INTERCOM KIT		
CONTROL UNIT TB#	FUNCTION	CONSOLETTE TB#
T1	Desk Set Mic Hi	TB2-7
T4	Desk Set Mic Lo	TB2-6
T2	Desk Set P-T-T	TB2-2**
T7	Ground	TB2-4
T6	3-Ohm Audio Hi	TB2-3
T8	PL Disable	TB2-8
T9*	A+	TB2-1

*T1373A Wallmount Local Control Unit only.
**P/O TLN1370A Intercom Kit

NOTE

For multiple control unit connections to a "Consolette" station without the intercom kit, refer to the TLN1218B Junction Box instruction manual.

f. Antenna Connection

Connect the antenna lead-in connector to the antenna connector on the back of the "Consolette" station.

g. AC Power Connection

(1) AC Power Source Requirements

(a) 120 volts, 60 Hz with TPN1084A Power Supply.

(b) 120 or 220 or 240 volts, 50 or 60 Hz with optional accessory TPN1088A Power Supply.

(2) Transformer Tap Connections (Model TPN1088A Only)

Refer to Figure 2 and verify proper connections as shown in the following table.

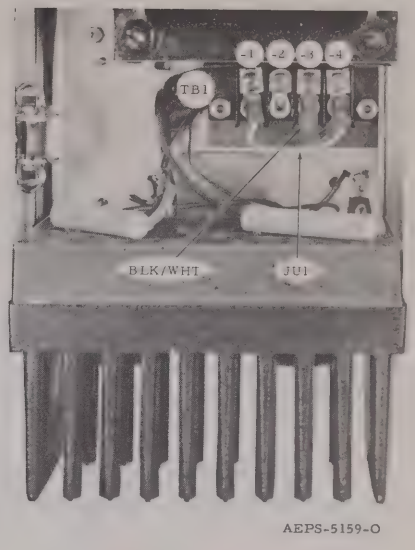


Figure 2.
Transformer Tap Connections

POWER SOURCE	CONNECTIONS	
	JU1	BLK/WHT LEAD
120 V ac	Between TB1-1 & -4	To TB1-3
220 V ac	Not Used	To TB1-2
240 V ac	Not Used	To TB1-1

(3) Power Connection

The three-wire ac line cord that is provided with the station is for use with a 120-volt power source ONLY -- simply connect the line cord to an ac outlet. For 220- and 240-volt operation remove and discard the line cord plug and install the station in accordance with local electrical codes.

4. INITIAL ADJUSTMENTS AND PRE-OPERATIONAL CHECKS

a. Power Supply

(1) Output Voltage Requirement

Power supply A+ output voltage has been accurately adjusted at the factory for optimum operation of the associated transmitter and receiver from a 120-volt ac power source. The A+ output voltage of the power supply must be checked and adjusted to 13.5-volts dc at the time of installation to insure proper operation from the specific power source.

(2) Output Voltage Adjustment Procedure

(a) With the Model TPN1088A Power Supply, be sure the transformer tap connections are correct for the specific power-source voltage being used.

(b) Connect a Motorola solid-state dc multimeter (or equivalent) between chassis ground and the junction of the red wire and R219 on the heat sink.

(c) Switch the base station "on". During "receive" conditions the voltmeter should read 13.5 volts.

(d) If the A+ output voltage is not 13.5 volts, turn VOLT ADJ control R208 to provide a voltmeter reading of 13.5 volts. This control is accessible through a hole in the top of the power supply chassis adjacent to the power receptacle.

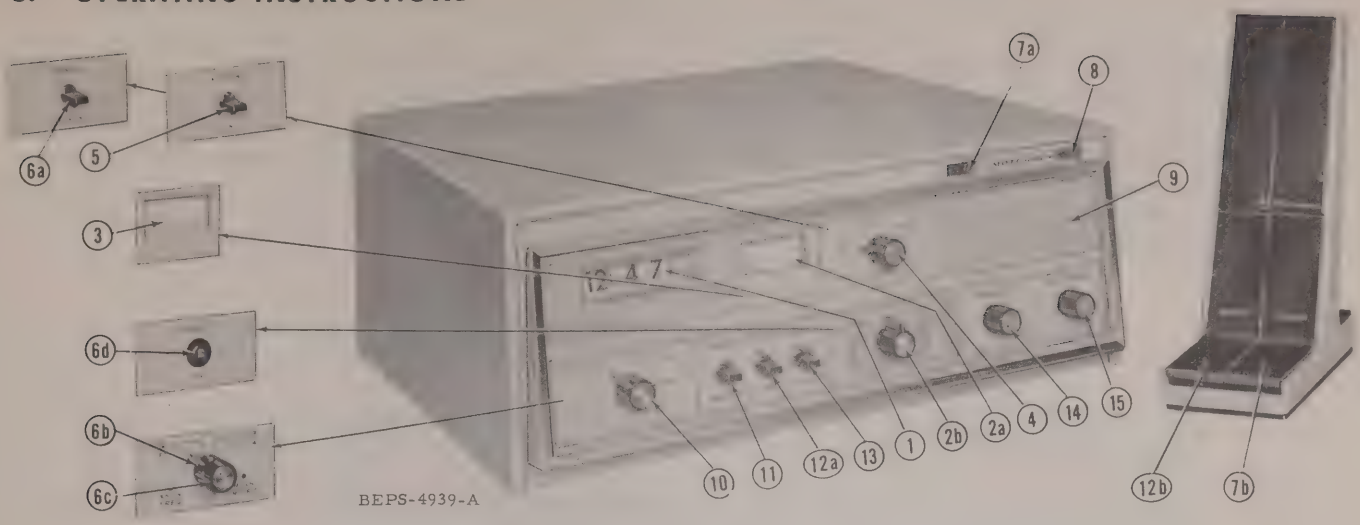
(3) Power Supply Reset Procedure

The power supply contains an over-current protection circuit which interrupts the A+ output when excessive current is drawn from the power supply. The radio is inoperable and the green light is unlit when this condition occurs. To restore normal operation, rotate the OFF-VOLUME control to the OFF position for approximately one-minute. If the overload condition no longer exists, operation will be restored when the OFF-VOLUME control is turned to the on position.

b. Transmitter-Receiver

The transmitter and receiver were accurately aligned at the factory before the station was shipped. However, the equipment should be checked before actual operation since it may have been mishandled during transit. FCC regulations also require that transmitter frequency, power and deviation be checked before the station is placed in operation.

5. OPERATING INSTRUCTIONS



All items shown cannot be installed in one station.

TO RECEIVE

1. Turn (15) clockwise until (8) lights.
2. Place (12a) in "PL" OFF position (PL Model Only).
3. Turn (14) fully counterclockwise.
4. Turn (15) clockwise until noise is heard at (9).
5. Adjust (14) slowly clockwise until noise is just squelched (cuts out).
6. Set (15) to desired listening level during reception of a signal.
7. Place (12a) to "PL" ON position (PL Models Only).

TO TRANSMIT

DO NOT TRANSMIT UNTIL CHANNEL IS CLEAR

1. Press (12b) on microphone momentarily to monitor channel (PL Models Only - monitoring is continuous with carrier squelch models).
2. If channel is clear, press (7b) and speak into microphone from about 12 inches. (7a) lights.
3. Idenfity yourself and mobile or station being called.
4. Release (7b) to listen.

---

(1) Clock -- remove plastic window and rotate "dials" to reset.

(2a) DC Meter and (2b) Switch -- permits monitoring of critical circuits, primarily by service personnel.

(3) VU Meter -- provides visual indication of audio input level to transmitter. Do not allow more than 0 VU while speaking into the microphone.

(4) SINGLE-TONE Switch -- permits selection of 5 different tone frequencies for selective signalling. The tone is transmitted automatically each time the transmitter is keyed. Place in the desired position.

(5) ALERT TONE Switch -- alerts the receiving station via a tone that a voice message is about to be transmitted. Push momentarily, and then transmit in a normal manner.

(6a) SCAN-OFF SCAN-ON Switch, (6b) XMTR FREQ Switch, (6c) RCVR PRIORITY Switch, and (6d) PRIORITY LIGHT -- permits operator to monitor 4 channels. Channel priority determined by (6c). Priority of remaining 3 channels is on a first come, first served basis.
Carrier Squelch Models Only -- place (6a) to SCAN-OFF and turn (14) clockwise until noise just stops.
All Models -- place (6b) in desired position and (6a) to SCAN-ON position. (6d) will light when a signal is received on the priority channel.

NOTE

While (6a) is in SCAN-OFF position, (6c) determines which one channel is monitored and (6d) remains on.

(7a) Transmit Lamp (RED) and (7b) TRANSMIT Switch -- (7a) provides a visual indication that transmitter is keyed. (7b) keys transmitter.

(8) Power On Lamp (GREEN) -- indicates that power is applied and station is "on". Flashes when operating on emergency power.

(9) Speaker -- messages heard here. Also used as a microphone during intercom operation.

(10) F1, F2, F3, F4 Channel Selector Switch -- selects operating channel. Place in desired position.

(11) NORMAL-INTERCOM Switch -- allows communication with parallel desk sets. Hold in INTERCOM position and speak directly into (9) -- DO NOT USE THE MICROPHONE. Release to receive.

NOTE

Radio messages will interrupt intercom operation.

(12a) "PL" ON-"PL" OFF Switch ("PL" Models Only) -- permits operator to hear all on-channel messages while in OFF position and only PL tone-coded messages while in ON position. (12b) MONITOR Switch - same function as (12a), press to monitor.

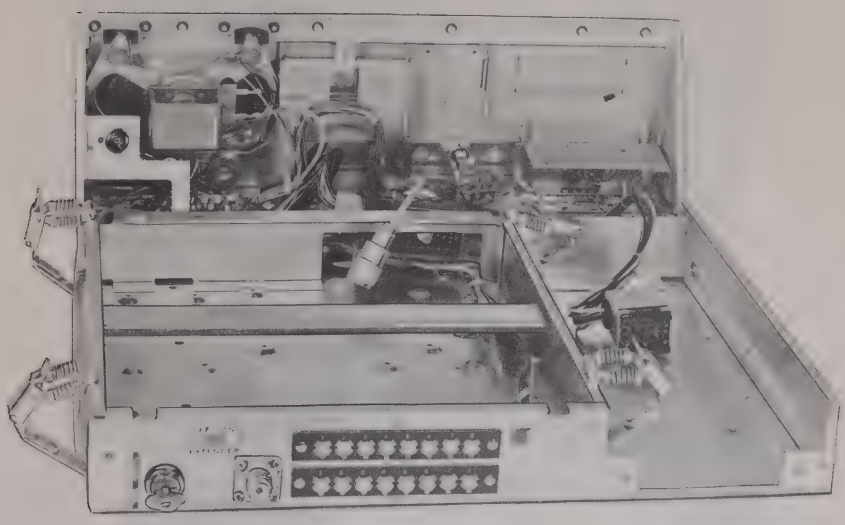
(13) NORMAL-TAKEOVER Switch -- gives control capability over parallel desk sets. Place in the TAKEOVER position to disable all parallel desk sets.

(14) SQUELCH Control -- relieves operator of listening to on-channel radio noise. Adjust as described in "TO RECEIVE".

(15) OFF-VOLUME Control -- used to turn on radio and set speaker output level. Adjust as described in "TO RECEIVE".

CONTROL PANEL AND CHASSIS

MODEL TLN4403A



AEPS-4488-A

1. DESCRIPTION

The compact design of the control panel and chassis requires a minimum of space for installation. The control panel on the front of this unit has all the necessary controls for local operation of the station. The rear of the unit is equipped with an antenna connector, two terminal boards for external connections, a key lock, and "Extender" switch (on 25-50 MHz "Extender" models only). All connections are made at the rear of the unit and need not be disturbed for removal of the transmitter-receiver unit.

The station cabinet facilitates ease of maintenance and is easily removed from the chassis by loosening two thumbscrews at the rear of the cabinet.

The transmitter-receiver unit is secured to the chassis by four quick-release snap fasteners which permit rapid removal for maintenance and access to optional accessory printed circuit boards mounted underneath.

2. MAINTENANCE

a. Cabinet Removal

Cabinet removal is as shown in Figure 1.

b. Transmitter-Receiver Removal

Refer to Figure 2.

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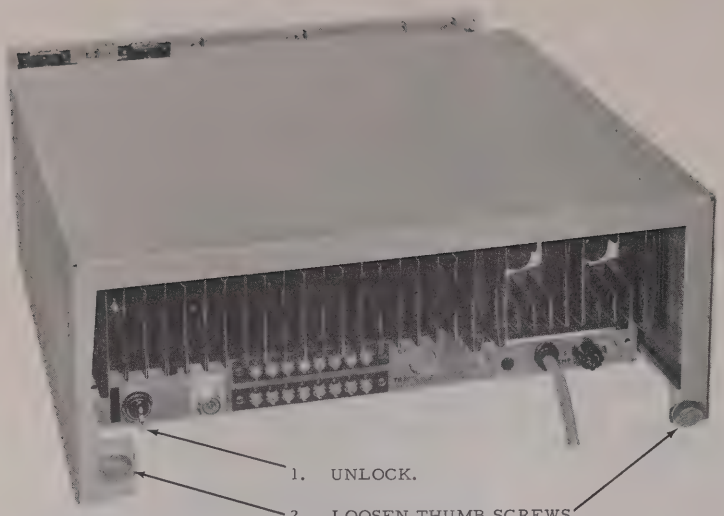

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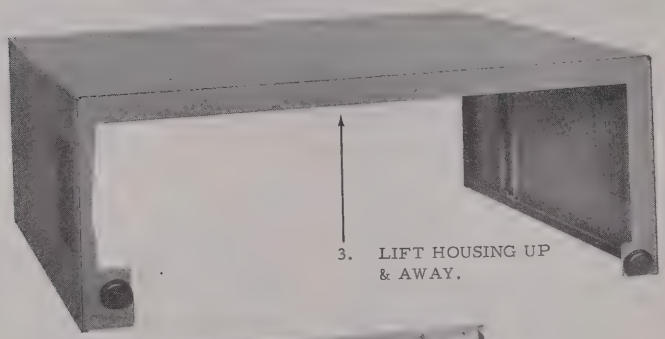
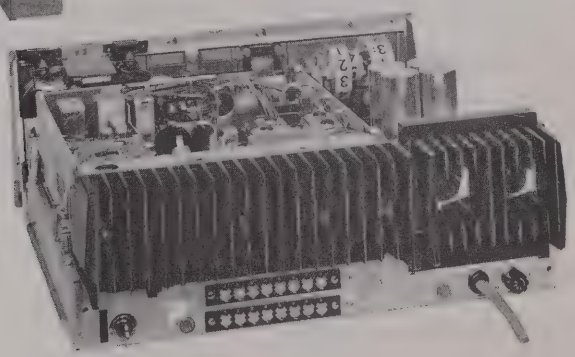




AEPS-4317-O

Figure 1.
Cabinet Removal

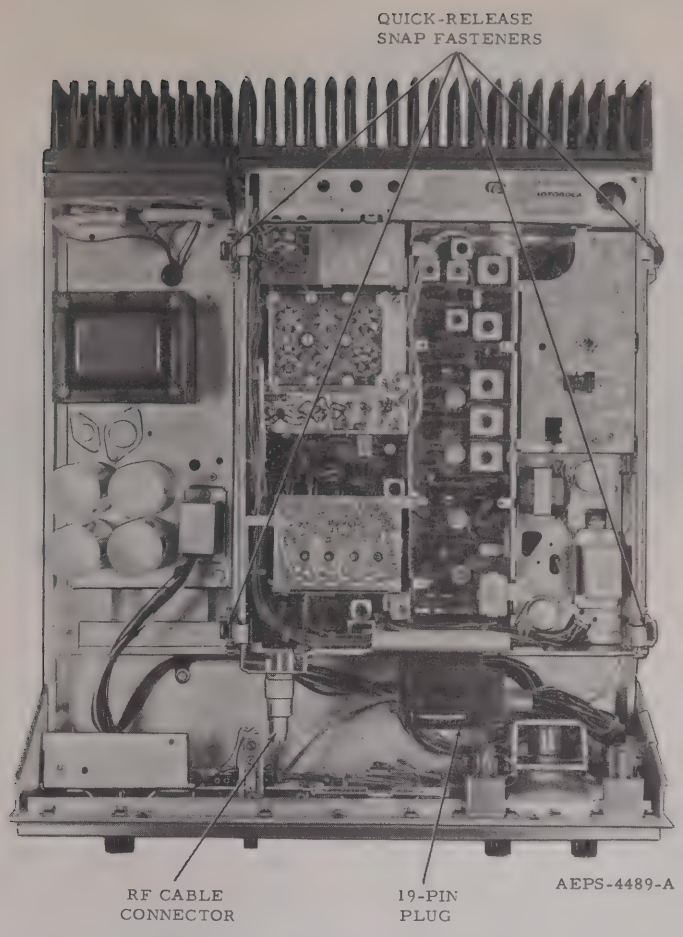


Figure 2.
Transmitter-Receiver Removal

(1) Disconnect the 19-pin plug from the receptacle on the front of the transmitter-receiver by turning the locking screw counterclockwise.

(2) Disconnect the rf cable connector from the front of the transmitter-receiver.

(3) Remove the transmitter and receiver metering cable plugs if metering facilities are included in the station. Unplug any push-on terminals of optional accessory kit leads which could interfere with removal of the transmitter-receiver. Be sure to note the location of these leads to ensure that they will be replaced correctly.

(4) Release the four quick-release snap fasteners from the transmitter-receiver and lift the unit away from the mounting supports.

c. Power Supply Removal

Refer to Figure 3.

(1) Disconnect the 15-pin power cable plug from the top of the power supply chassis.

(2) Four screws secure the power supply chassis to the base station bottom plate. Remove two screws from the top of the power supply chassis near the front of the unit and two screws at the back of the base station below the power supply heat radiator.

(3) Lift the power supply chassis with ac line cord attached straight up and away from the control panel and chassis.

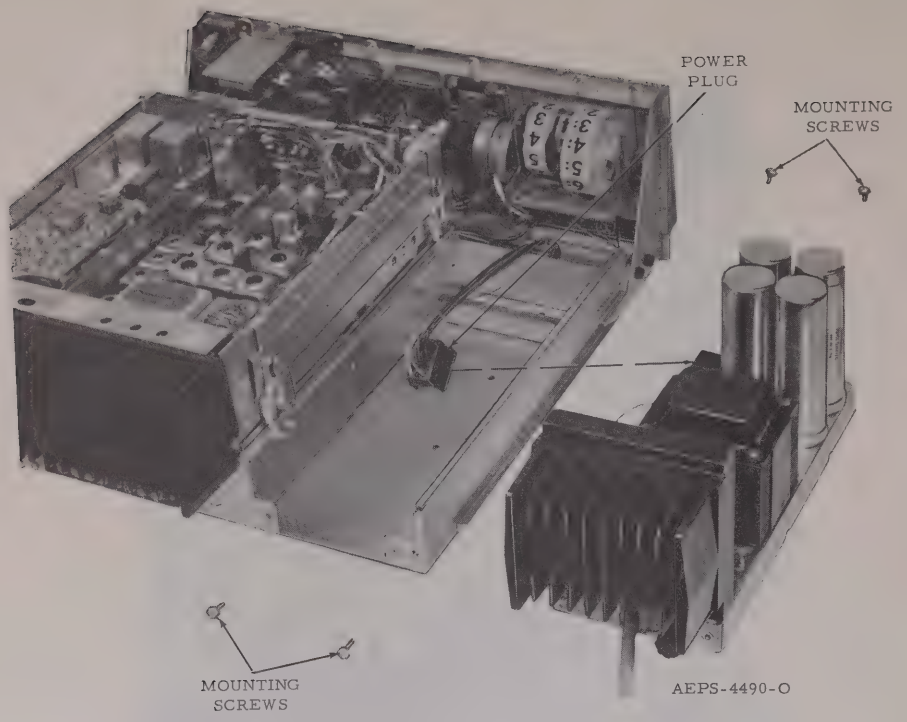


Figure 3.
Power Supply Removal

d. Control Panel Access

Refer to Figure 4.

(1) Remove two screws on each side of control panel as shown.

(2) Fold the control panel down and away from the chassis for access to control panel components.

e. Terminal Strip Location

Terminal strip locations are as shown in Figure 5.

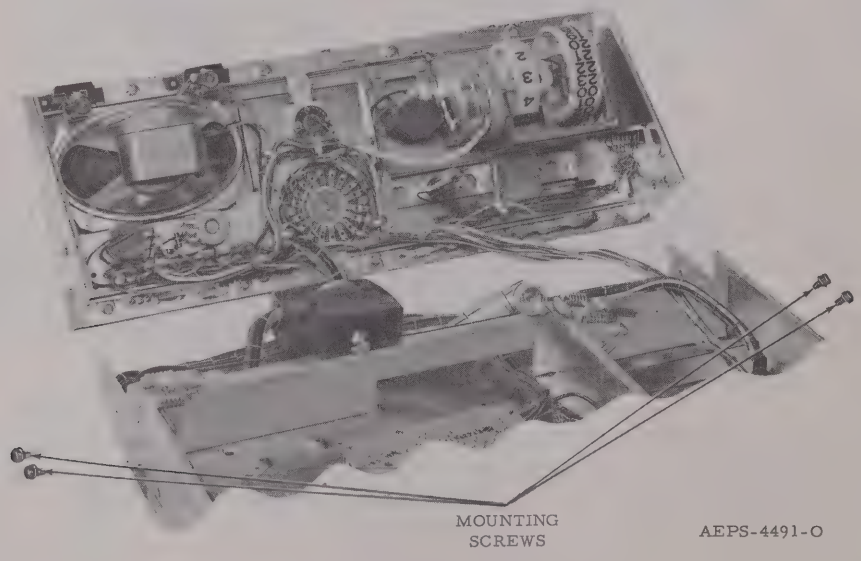


Figure 4.
Control Panel Access

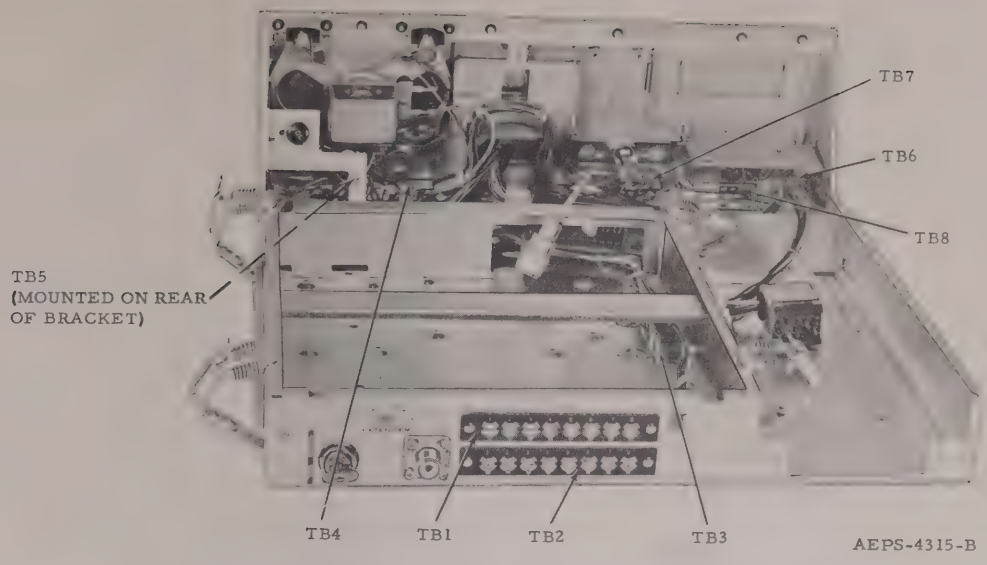


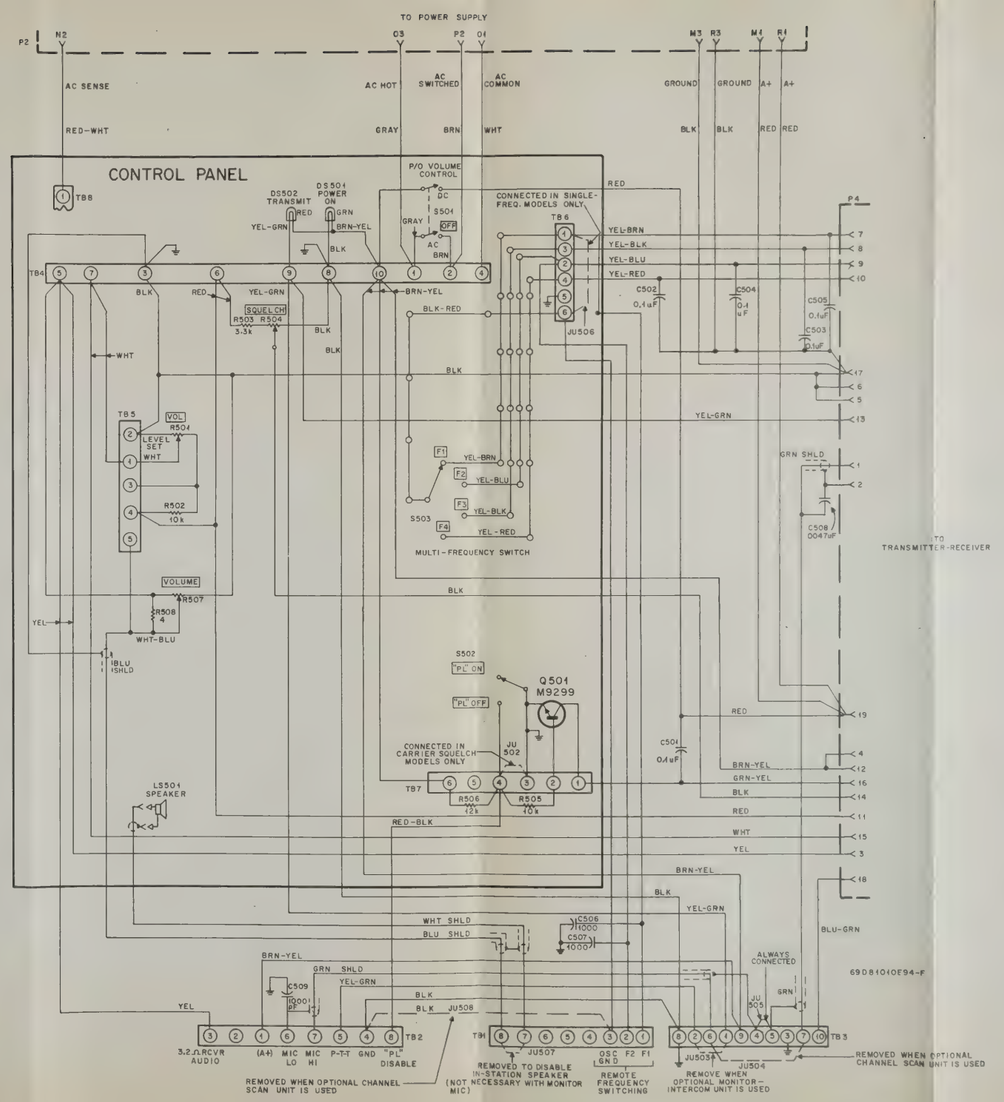
Figure 5.
Terminal Strip Location

TO
ER-RECEIVER

PTIONAL
NIT IS USED

CONTROL PANEL AND CHASSIS

Control Panel & Chassis
Wiring Diagram
Motorola No. 69D81010E94-F
2/7/73-UP



Control Panel & Chassis
Wiring Diagram
Motorola No. 69D81010E94-F
2/7/73-UP

PARTS LIST

TLN4403A Panel & Chassis Kit
TLN4414A PL Switch Kit — PL-1105-C

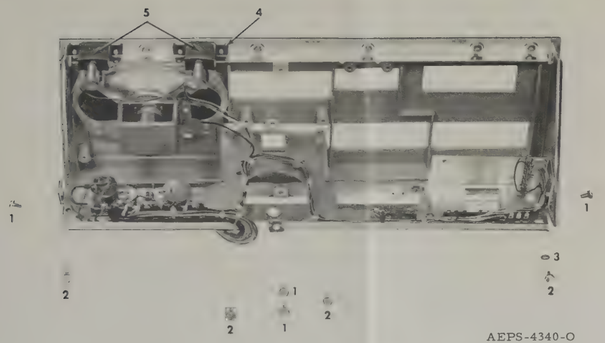
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C501	21C82372C01	0.1 uF +80-20%; 25 V
C502	21C82372C01	0.1 uF +80-20%; 25 V
C503	21C82372C01	0.1 uF +80-20%; 25 V
C504	21C82372C01	0.1 uF +80-20%; 25 V
C505	21C82372C01	0.1 uF +80-20%; 25 V
C506	21D82187B14	1000 pF ±10%; 100 V
C507	21D82187B14	1000 pF ±10%; 100 V
C508	21D82428B09	.0047 uF ±10%; 100 V
C509	21D82187B14	1000 pF ±10%; 100 V
		LAMP, incandescent:
DS501	65C82010C03	14 V; .08 A; type No. 756
DS502	65C82010C03	14 V; .08 A; type No. 756
		CONNECTOR, adapter: coaxial:
E1	28A48250	male and female; right-angle type
		CONNECTOR, receptacle: coaxial:
J501	9A85615	female; does not include 15B483599 SHIELD
		LOUDSPEAKER, magnetic:
LS501	50D82774C01	oval; 3" x 5"; 3.2 ohms impedance; weatherproof type
		CONNECTOR, plug:
P1		(part of W1)
P2		includes 14C82337A02 BODY 29C82335A01 TERMINAL, contact; 15C83934A13 SHELL 37K83159 GROMMET, rubber
P3	28A42310	male; coaxial; uhf type; does not include 58A854020 ADAPTER, connector
P4		includes; 9C801050 CONNECTOR, receptacle: 19-contact; female; 15D82075D01 SHELL (right half); 15D82075D03 SHELL (left half); 3S131758 SCREW, machine: 4-40 x 1-1/8" slotted binder head; 2 required; 2S129924 NUT, machine: 4-40 x 1/4" hex; 2 required; 1V80717A73 SCREW & THUMBWHEEL ASSEMBLY; 4A11722 "C" WASHER; 4A800671 WASHER .016" thick; 4A82113D01 WASHER: .032" thick; 42C864148 CLAMP, cable strain relief; 3S132127 SCREW, tapping: No. 6 x 3/4" plain hex head; 2 required 37K61348 TUBING, rubber: 8" length required; 11S2541 TUBING, plastic: clear; 1" length required
		TRANSISTOR: (SEE NOTE)
Q501	48R869299	N-P-N; type M9299
		RESISTOR, fixed; ±10%; 1/2 W: unl. stated
R501	18K857698	variable: 25K ±30%; 0.16 W;
R502	6S6320	10K
R503	6S5581	3.3K
R504	18D82700D07	variable: 25K ±30%; 0.16 W
R505	6S129225	10K; 1/4 W
R506	6S129230	12K; 1/4 W
R507	18C82528D04	variable: 20 ±20%; 2 W; incl. dpst switch (S501); does not incl. 14B83126D01 INSULATOR switch terminal
R508	17D82177B03	4; 5 W
		SWITCH:
S501		(part of R507)
S502	40D83303G01	lever, spst; nor. open; locking
		TERMINAL BOARD:
TB1	31B82573C07	8 single screw terminals; coded 1 thru 8
TB2	31B82573C07	8 single screw terminals; coded 1 thru 8
TB3	31S120975	10 soldering lug terminals; (No. 2 & No. 8 ground)
TB4	31S120975	10 soldering lug terminals; (No. 2 & No. 8 ground)
TB5		NOT USED
TB6	31S127609	6 soldering lug terminals; (No. 2 ground)
TB7	31S129354	6 soldering lug terminals; (No. 3 ground)
TB8	31S135071	11 soldering lug terminals; (No. 4 & No. 8 ground)
		LINE, RF transmission:
W2	1V80713B48	includes E1, J1, P3 and 30C82921H01 CABLE, RF: coaxial; 28" length required
		LAMPHOLDER:
XDS501	9B82778C01	miniature bayonet type
XDS502	9B82778C01	miniature bayonet type
		NON-REFERENCED ITEMS
	55B83660E01	LOCK SET, rim: includes 55K893872 KEY
	15B83154G01	SHIELD, light: for DS501, 502
	36B82629H02	KNOB, control: for R501, 504
	65B83241G01	LENS, indicator light: RED
	65B83241G02	LENS, indicator light: GRN

TLN4413A Multi-Frequency Switch Kit — PL-1953-O

		SWITCH, rotary
S503	40C83304G01	Adjustable; 2, 3, or 4 position

NOTE:

Replacement transistors must be ordered by Motorola part number only for optimum performance.



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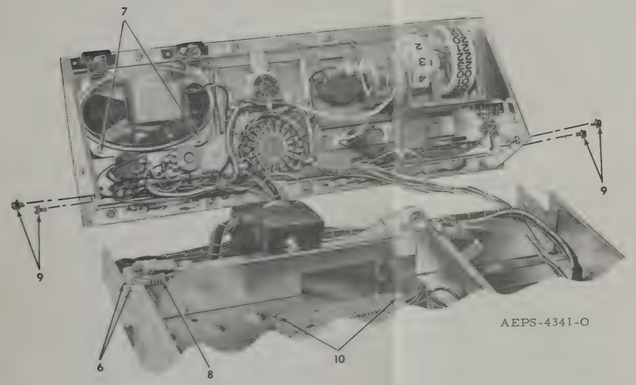

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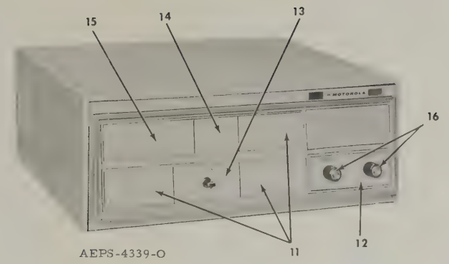

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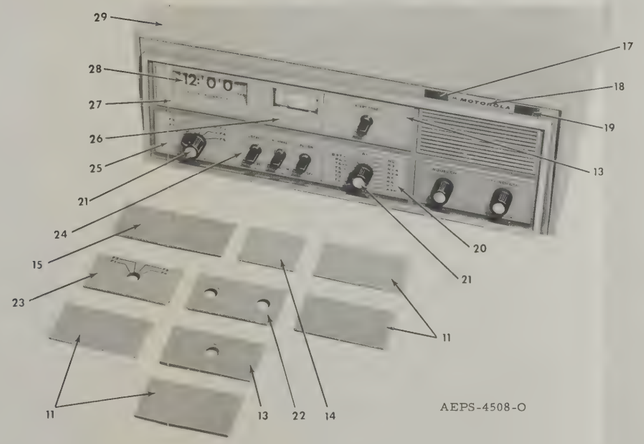


AEPS-4508-O

CONTROL PANEL AND CHASSIS

Control Panel & Chassis Kit
Parts List
Motorola No. PEPS-4492-B
2/7/73-UP

PARTS LIST

Mechanical Parts List PL-1098-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	3S134186	SCREW, tapping: No. 6-32 x 5/16"; Plain hex head; 4 req'd
2	3S3398	SCREW, tapping: No. 6-20 x 3/8"; Plain hex head; 4 req'd
3	4S1720	FLATWASHER, .156-3/8" -030 steel cad
4	2A83599D02	NUT, speed; 4 req'd
5	15B83154G01	COVER, lamp; 2 req'd
6	55A838718	CATCH
7	3S488098	SCREW, tapping: No. 8-18 x 3/8"; Plain hex head; 4 req'd
8	1V80713B47	FASTENER, quick-release snap
9	3S135049	SCREW, tapping: No. 10 x 3/8" Plain hex head; 4 req'd
10	3S125790	SCREW, machine: No. 4-40 x 5/16"; Pain hex head
11	64D83071G01	INSERT, blank
12	64D83123G01	PANEL, front: includes bezel
13	64D83071G07	INSERT, panel (switch)
14	64D83073G01	INSERT, blank (meter)
15	64D83074G01	INSERT, blank (clock)
16	36B82629H02	KNOB, control: 2 req'd
17	65B83241G01	JEWEL, red
18	33A83318G01	NAMEPLATE
19	65B83241G02	JEWEL, green
20	64D83071G10	INSERT, dc meter switch
21	36B82630H01	KNOB, pointer
22	64D83071G13	INSERT, panel (2 switch)
23	64D83071G08	INSERT, multi-freq.
24	64D83071G12	INSERT, panel (3 switch)
25	64D83071G14	INSERT, multi-freq single-tone
26	64C83071G02	INSERT, meter
27	64C84217A01	INSERT, clock
28	61B83072G01	WINDOW, clock
29	15E84922B01	HOUSING

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN4403A Panel & Chassis Kit
TLN4414A Pl. Switch Kit PL-1105-C

		CAPACITOR, fixed:
C501	21C82372C01	0.1 uF +80-20%; 25 V
C502	21C82372C01	0.1 uF +80-20%; 25 V
C503	21C82372C01	0.1 uF +80-20%; 25 V
C504	21C82372C01	0.1 uF +80-20%; 25 V
C505	21C82372C01	0.1 uF +80-20%; 25 V
C506	21D82187B14	1000 pF ±10%; 100 V
C507	21D82187B14	1000 pF ±10%; 100 V
C508	21D82428B09	.0047 uF ±10%; 100 V
C509	21D82187B14	1000 pF ±10%; 100 V
		LAMP, incandescent:
DS501	65C82010C03	14 V; .08 A: type No. 756
DS502	65C82010C03	14 V; .08 A: type No. 756
		CONNECTOR, adapter: coaxial:
E1	28A48250	male and female: right-angle type
		CONNECTOR, receptacle: coaxial:
J501	9A85615	female: does not include 15B483599 SHIELD
		LOUDSPEAKER, magnetic:
LS501	50D82774C01	oval: 3" x 5": 3.2 ohms impedance: weatherproof type
		CONNECTOR, plug:
P1		(part of W1)
P2		includes 14C82337A02 BODY 29C82335A01 TERMINAL, contact: 15C83934A13 SHELL 37K83159 GROMMET, rubber
P3	28A42310	male; coaxial: uhf type: does not include 58A854020
P4		ADAPTER, connector includes: 9C801050 CONNECTOR, receptacle: 19-contact; female: 15D82075D01 SHELL (right half); 15D82075D03 SHELL (left half); 3S131758 SCREW, machine: 4-40 x 1-1/8" slotted binder head: 2 required: 2S129924 NUT, machine: 4-40 x 1/4" hex; 2 required: 1V80717A73 SCREW & THUMBWHEEL ASSEMBLY: 4A11722 "C" WASHER: 4A800671 WASHER .016" thick: 4A82113D01 WASHER: .032" thick: 42C86448 CLAMP, cable strain relief: 3S132127 SCREW, tapping: No. 6 x 3/4" plain hex head; 2 required 37K61348 TUBING, rubber: 8" length required: 11S2541 TUBING, plastic: clear: 1" length required
		TRANSISTOR: (SEE NOTE)
Q501	48R869299	N-P-N: type M9299
		RESISTOR, fixed: ±10%; 1/2 W: unl. stated
R501	18K857698	variable: 25K ±30%; 0.16 W:
R502	6S5320	10K
R503	6S5581	3.3K
R504	18D82700D07	variable: 25K ±30%; 0.16 W
R505	6S129225	10K: 1/4 W
R506	6S129230	12K: 1/4 W
R507	18C82528D04	variable: 20 ±20%; 2 W: incl. dpst switch (S501); does not incl. 14B83126D01 INSULATOR switch terminal
R508	17D82177B03	4: 5 W
		SWITCH:
S501		(part of R507)
S502	40D83303G01	lever, spst; nor. open; locking
		TERMINAL BOARD:
TB1	31B82573C07	8 single screw terminals: coded 1 thru 8
TB2	31B82573C07	8 single screw terminals: coded 1 thru 8
TB3	31S120975	10 soldering lug terminals: (No. 2 & No. 8 ground)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

TB4	31S120975	10 soldering lug terminals: (No. 2 & No. 8 ground)
TB5		NOT USED
TB6	31S127609	6 soldering lug terminals: (No. 2 ground)
TB7	31S129354	6 soldering lug terminals: (No. 3 ground)
TB8	31S135071	11 soldering lug terminals: (No. 4 & No. 8 ground)
		LINE, RF transmission:
W2	1V80713B48	includes E1, J1, P3 and 30C82921H01 CABLE, RF: coaxial: 28" length required
		LAMPHOLDER:
XDS501	9B82778C01	miniature bayonet type
XDS502	9B82778C01	miniature bayonet type
	NON-REFERENCED ITEMS	
	55B83660E01	LOCK SET, rim: includes 55K893872 KEY
	15B83154G01	SHIELD, light: for DS501, 502
	36B82629H02	KNOB, control: for R501, 504
	65B83241G01	LENS, indicator light: RED
	65B83241G02	LENS, indicator light: GRN

TLN4413A Multi-Frequency Switch Kit PL-1953-O

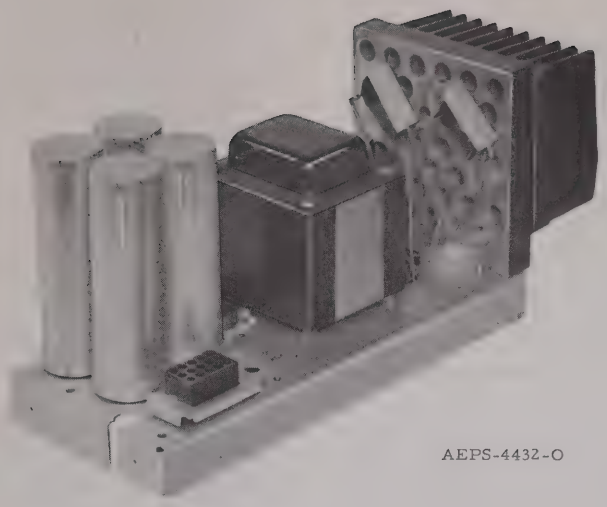
		SWITCH, rotary
S503	40C83304G01	Adjustable; 2, 3, or 4 position

NOTE:

Replacement transistors must be ordered by Motorola part number only for optimum performance.

POWER SUPPLY

MODELS TPN1084A & TPN1088A



AEPS-4432-O

TECHNICAL CHARACTERISTICS

PRIMARY POWER SOURCE	TPN1084A	120 volts rms ±20%; 60 Hz ac
	TPN1088A (Optional)	120, 220, 240 volts rms ±20%; 50/60 Hz ac (factory set for 120 V operation)
OUTPUT RATING		13.5 volts dc at 15 amps (regulated)
LOAD REGULATION		13.5-0.5 volts for 0 to 15 amp load
LINE REGULATION		13.5 ±0.5 volts for +20-10% variation of line voltage
WEIGHT		approximately 14 lbs.
DIMENSIONS		5-5/8" high x 13" long x 4-1/2" wide, overall

1. DESCRIPTION

These power supplies are compact, fully transistorized dc power sources for solid-state "Consolette" base stations. The 120-volt only (Model TPN1084A) power supply is supplied with all stations unless the 120-, 220-, 240-volt (Model TPN1088A) supply is ordered as an optional accessory. Both power supplies are similar--power transformers are different and a primary voltage selection terminal strip is used with the Model TPN1088A. The power supplies provide 13.5 volts (nominal) dc regulated output to the base station.

A 15-pin receptacle on the power supply chassis provides all necessary power and control connections to the base station front panel and the transmitter-receiver chassis via the station intercabling facitities. The power supplies are designed as self-contained units and are easily removed from the base station chassis assembly for maintenance purposes.

The power supply consists of a power transformer, four bridge-connected silicon diode rectifiers, capacitive filter, series transistor regulator, over-voltage and short circuit protection circuitry. The two regulator transistors are mounted on an efficient head radiator to ensure safe operating temperature. Overload protection

POWER SUPPLY

MOTOROLA INC. Communications Division
ENGINEERING PUBLICATIONS 1301 E. ALGONQUIN ROAD SCHAUMBURG, ILLINOIS 60172

for the primary circuit is provided by a 5-amp fuse. Overload protection for the secondary is provided by a 20-ampere fuse. A three-conductor line cord provides 120-volt ac primary power connections to the power supply. The line cord plug must be removed and a proper connection made to the power source for 220- or 240-volt operation.

2. PRE-OPERATIONAL CONNECTION AND ADJUSTMENT

a. General

Power supply A+ output voltage has been accurately adjusted at the factory for optimum operation of the associated transmitter and receiver from a 120-volt ac power source. A+ output voltage of the power supply must be checked and adjusted at the time of installation to 13.5-volts dc, if necessary, to insure proper operation from the specific power source.

b. Transformer Tap Connections (Model TPN1088A Only)

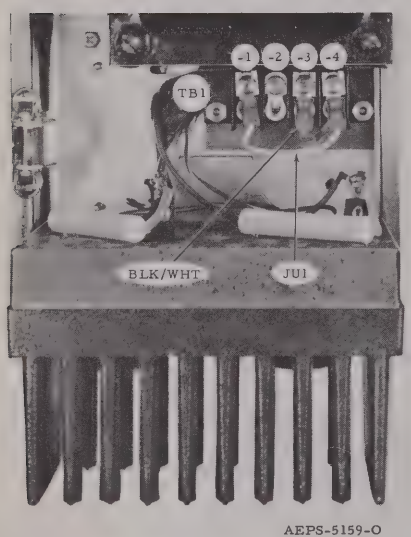


Figure 1.
Transformer Tap Connections
(Model TPN1088A Only)

Refer to Figure 1 and verify proper connections as shown in the following table.

POWER SOURCE	CONNECTIONS	
	JU1	BLK/WHT LEAD
120 V ac	Between TB1-1 & -4	To TB1-3
220 V ac	Not Used	To TB1-2
240 V ac	Not Used	To TB1-1

c. Line Cord Plug Removal (220- and 240-Volt Operation Only)

The line cord plug supplied with both model power supplies is for use with a 120-volt power source ONLY. This plug must be removed and discarded for 220- and 240-volt operation and the station installed in accordance with local electrical codes.

d. Voltage Adjustment Procedure

(1) With the Model TPN1088A Power Supply, be sure the transformer tap connections are correct for specific power source voltage being used.

(2) Connect a Motorola solid-state dc multimeter (or equivalent) between chassis ground and the junction of the red-white wire and R219 on the heat radiator.

(3) Switch "on" the base station. During "receive" conditions the voltmeter should read 13.5 volts.

(4) If the A+ output voltage is not 13.5 volts, turn the VOLT ADJ control R208 to provide a voltmeter reading of 13.5 volts. This control is accessible through a hole in the top of the power supply chassis adjacent to the power receptacle as shown in Figure 2.

3. CIRCUIT OPERATION

a. Rectifier and Filter Circuit

The secondary voltage (18 volts ac nominal) from power transformer T201 is rectified by the full wave bridge rectifier CR201, CR202, CR203, CR204 and filtered by capacitors C201, C202, C203, C204, resulting in a positive dc voltage of 24 volts. This filtered voltage is used as the collector voltage for the series regulator consisting of Q205 and Q207, and operating voltage for the remaining stages of the power supply.

b. First and Second Driver, and Turn-On

The 24 volts developed by the bridge is applied to the first driver, Q201, which with its hard bias

is a constant current generator. Transistor Q201 supplies the constant current to second driver Q203 driving it into saturation. When Q203 turns on, a full drive is applied to Q204 because its base is pulled closer to ground. When Q204 turns on, series pass transistors, Q205 and Q207, turn on and supply the output voltage. As the output voltage increases the reference amplifier then will maintain the regulated output at the set voltage.

c. Series Regulator

Resistor R217, connected to the bases of transistors Q205 and Q207, develops the base-bias voltage for the transistors, causing them to conduct. With the transistors conducting, the filtered dc voltage existing at the bridge rectifier output is first regulated to 13.5 volts by the transistors and then applied to the transmitter and receiver circuitry as the A+ voltage.

d. Reference Amplifier

If the power supply loading decreases so that the output voltage starts to increase, the base bias voltage at reference amplifier transistor Q202 is also increased. This rise in base bias voltage drives the transistor towards saturation which causes its collector voltage to decrease. The collector output is fed to the base of the first driver transistor, Q203, to reduce its base-bias voltage. Consequently, transistor Q203 conducts less current, which causes second-driver transistor Q204 and series-regulator transistors Q205 and Q207 to be driven towards cut-off. When this happens, the impedance of the series regulator transistors increase proportionately, causing the output (A+) voltage applied to the associated transmitter and receiver to decrease to its initial level of 13.5 volts. Should the output voltage decrease as a result of power supply loading, the circuit action previously described is reversed, causing the output voltage to increase to its normal operating point.

Variable resistor R208 in the base circuit of reference amplifier transistor Q202, permits adjustment of the output voltage to the required operating level of 13.5 volts in the receive condition.

e. Over-Voltage Protection

Over-voltage protection is provided by Q206. When the power supply is operating normally, the 16-volt Zener diode does not conduct, leaving the base-bias circuit of Q206 open and held to the emitter by R214. If the output voltage exceeds 16 volts, the 16-volt Zener diode starts to conduct and supplies a turn-on voltage for Q206 when the output voltage reaches a level high enough to provide at least 0.6 volt drive across R214. This drive turns on Q206 which applies a current to the gate of CR205 and turns it on. When CR205 turns on, the bridge circuit and capacitors C201, C202, C203 and C204 are shorted to ground thru F202.

This blows the fuse and shuts off the power supply.

f. Short Circuit Protection and Current Limiting

Short circuit protection and current limiting is provided by the control circuit comprised of Q208 and CR210. The output current of one of series-pass transistor Q207 is monitored via R219. When the current reaches a high enough level, the voltage across R219 turns on Q208. A voltage-divider network consisting of R221 and R222 sets the current at which Q208 starts to conduct. When Q208 conducts, it supplies drive to CR210 through R216.

Silicon control rectifier CR210 conducts, and latches on. This pulls the base of Q203 to ground through CR209, and pulls the emitter of Q201 closer to ground than its base through the voltage divider comprised of R203 and R205. This reverse biases the base-emitter junction of both Q201 and Q203, cutting them off. This results in power-supply shut down.

When the short circuit condition is removed, the power supply can be reset by removing the 120- or 240 volt ac primary voltage (turn on-off switch to off) for approximately one minute. This allows sufficient time for filter capacitors C201, C202, C203 and C204 to discharge to ground through R203, R205, CR209 and CR210. As the current through CR210 approaches zero, this device turns off and normal power supply operation will be restored when primary ac voltage is reapplied.

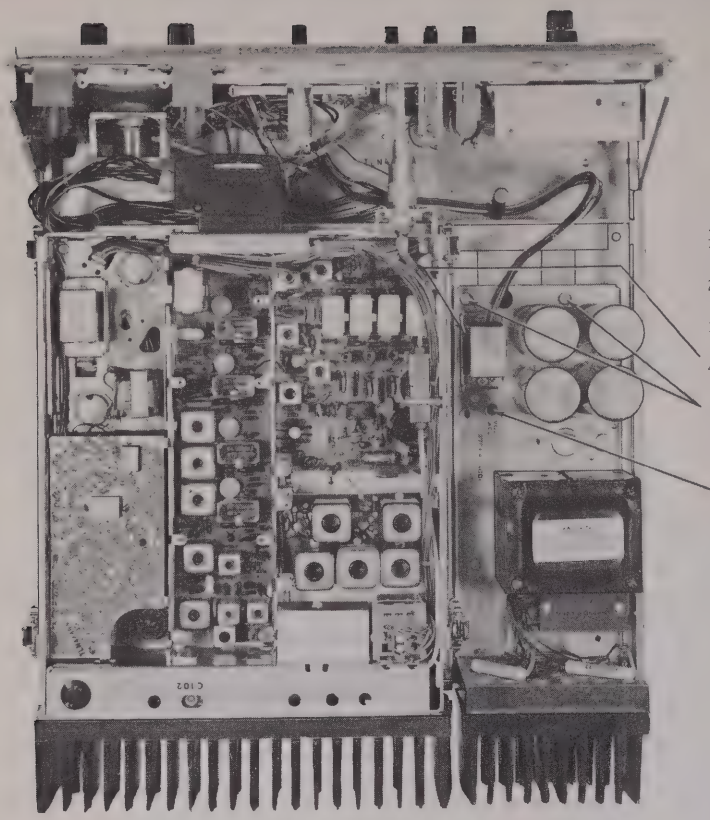
4. MAINTENANCE

a. Removal and Replacement of Power Supply

Refer to Figure 2 for instructions to remove and replace the power supply from the base station.

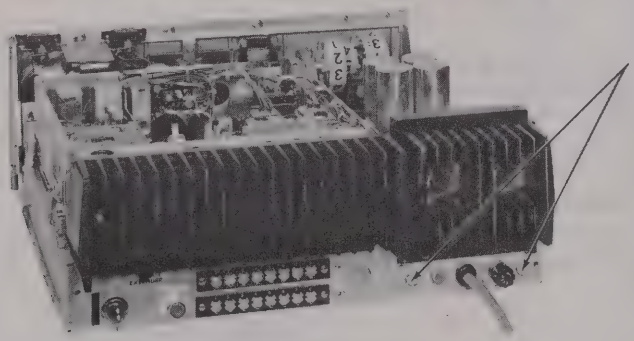
b. Removal and Replacement of Circuit Board

Refer to Figure 3 for instructions to remove and replace the circuit board from the power supply.



REMOVAL PROCEDURE

1. TURN OFF BASE STATION POWER
2. UNPLUG BASE STATION FROM SOURCE.
3. REMOVE THE BASE STATION CABINET (DESCRIBED ELSEWHERE).
4. DISCONNECT THE 15-PIN POWER CABLE PLUG.
5. REMOVE THE TWO SCREWS FROM THE TOP OF THE POWER SUPPLY CHASSIS.



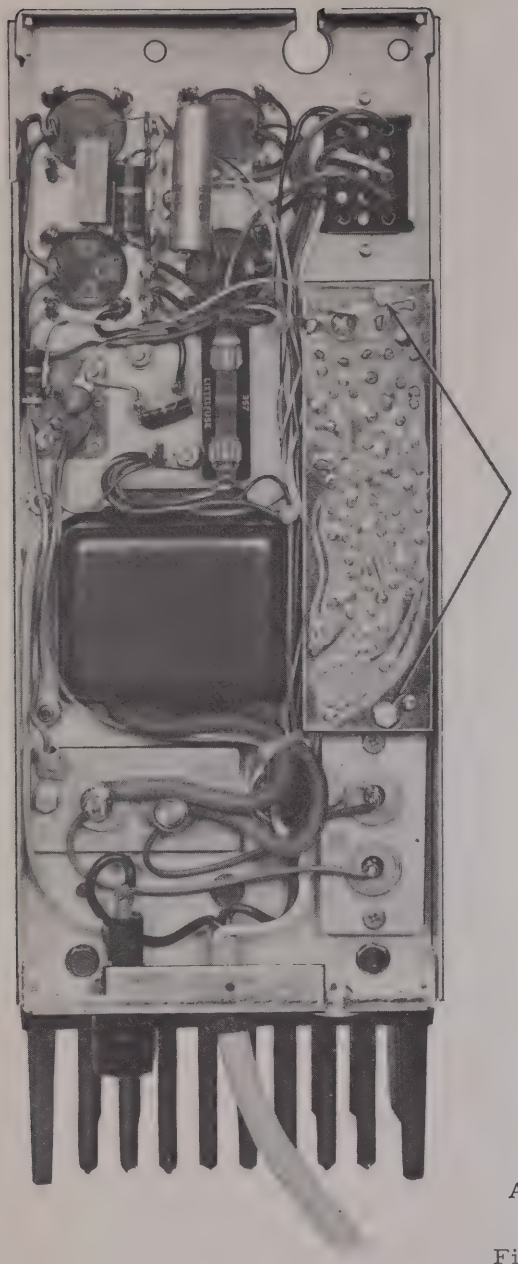
6. REMOVE TWO SCREWS AT THE BACK OF THE BASE STATION BELOW THE POWER SUPPLY HEAT SINK.
7. LIFT THE POWER SUPPLY CHASSIS WITH THE AC LINE CORD ATTACHED STRAIGHT UP AND AWAY FROM THE BASE STATION CHASSIS.

REPLACEMENT PROCEDURE

8. REPLACE THE POWER SUPPLY IN THE REVERSE ORDER.

BEPS-4430-A

Figure 2.
Removal and Replacement of Power Supply



REMOVAL PROCEDURE

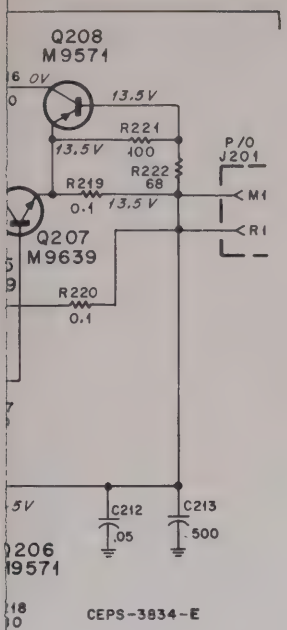
1. REMOVE THE POWER SUPPLY FROM THE BASE STATION CHASSIS AS DESCRIBED IN FIGURE 1.
2. UNSCREW THE TWO MOUNTING SCREWS.
3. CAREFULLY LIFT OUT BOARD.

REPLACEMENT PROCEDURE

4. REPLACE THE CIRCUIT BOARD IN THE REVERSE ORDER.

AEPS-4431-A

Figure 3.
Removal and Replacement of Circuit Board



CEPS-3834-E

NG CONDITIONS:
GE.
OUTPUT
C AT 1 AMPERE.

NOTES:

201. UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICROFARADS. RESISTOR VALUES ARE IN OHMS.
202. UNLESS OTHERWISE STATED, VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES MEASURED WITH A MOTOROLA SOLID-STATE DC MULTIMETER.

EPS-4423-B

MODEL TABLE

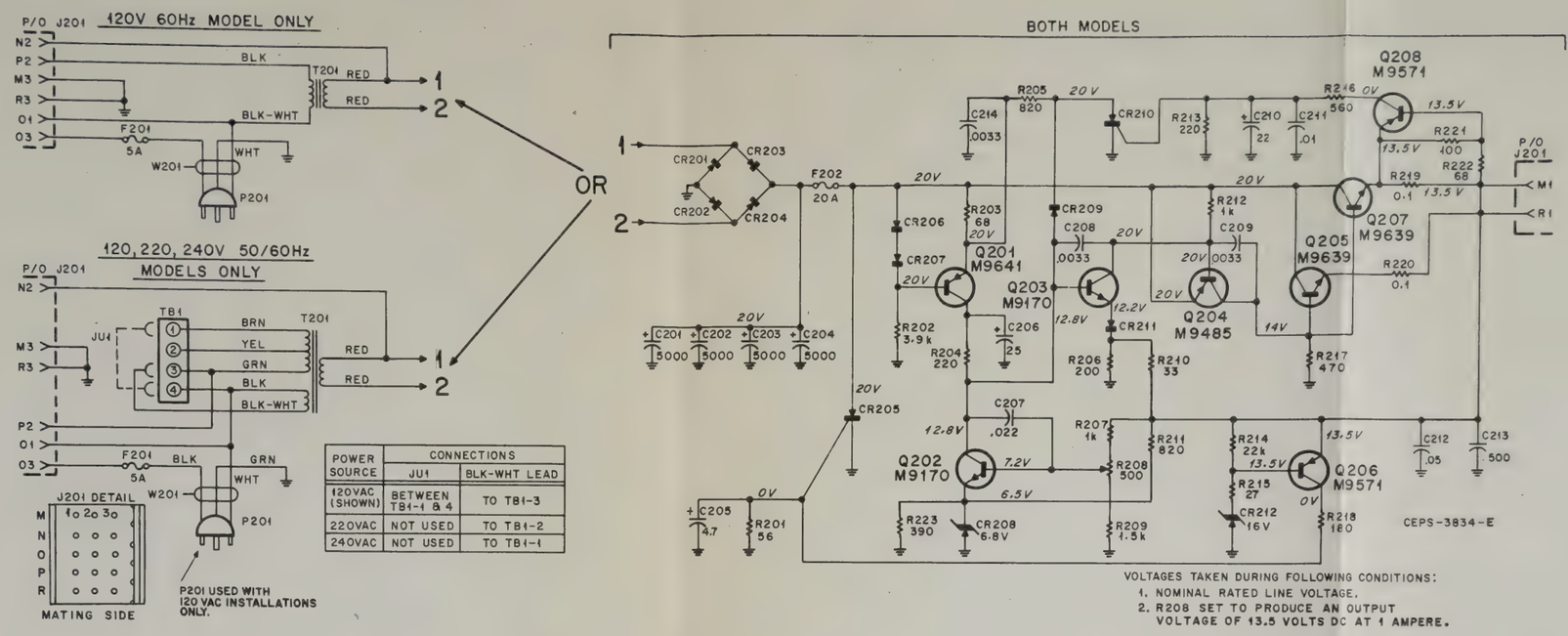
MODEL	SUFFIX	SUB-MODELS	SUFFIX	DESCRIPTION
TPN1084A		TLN4404A		CHASSIS KIT
120 VOLT		TLN4405A	2	CIRCUIT BOARD
TPN1088A		TLN4478A		CHASSIS KIT
120, 220, 240 VOLT		TLN4405A	2	CIRCUIT BOARD

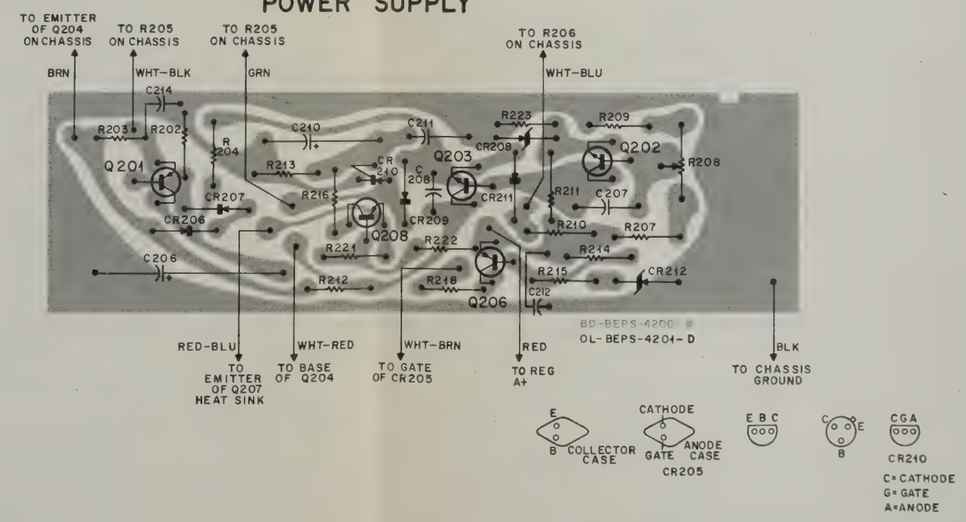
EPS-5164-B

POWER SUPPLY

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Power Supply
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E92-E
12/10/73-UP





NOTES:

201. UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICROFARADS. RESISTOR VALUES ARE IN OHMS.
202. UNLESS OTHERWISE STATED, VOLTAGE MEASUREMENTS ARE FOR DC VOLTAGES MEASURED WITH A MOTOROLA SOLID-STATE DC MULTIMETER.

EPS-4423-B

MODEL TABLE

MODEL	SUFFIX	SUB-MODELS	SUFFIX	DESCRIPTION
TPN1084A		TLN4404A		CHASSIS KIT
120 VOLT		TLN4405A	-2	CIRCUIT BOARD
TPN1088A		TLN4478A		CHASSIS KIT
120, 220, 240 VOLT		TLN4405A	2	CIRCUIT BOARD

EPS-5164-B

POWER SUPPLY

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Power Supply
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E92-E
12/10/73-UP

MOTOROLA PART NO.	DESCRIPTION
	4.9 ohms sec; RED, RED res 0.035 ohms (TPN1088A only)
	TERMINAL BOARD:
31A898341	4 terminals
	CABLE ASSEMBLY, power:
30C83211C05	consists of a 3-conductor cable ("zip cord") and a "molded-on" 3-contact male plug (P201); each conductor No. 18 ga., str; length overall 9 ft.
	FUSEHOLDER:
9C82083C03	extractor post type
9B83909E01	wafer type
	SOCKET, transistor:
9C83662A01	2-contact
NON-REFERENCED ITEMS	
14A865854	INSULATOR, mounting for CR205
4K801846	WASHER, insulating; for CR205; 2 required
4C82418B90	WASHER, insulating; for CR201, CR202, CR203, CR204
14A83575A01	INSULATOR, mounting for Q203
38K10388	BUTTON, plug
7A83959A01	PLATE, heat sink; 2 required; for CR201 thru 204
14A83168H01	INSULATOR, plate mounting for insulating CR201, CR203 mounting plate
14A83967A03	WASHER, insulating; for CR201 thru 204; 4 required
4B82345A13	WASHER, insulating; for terminals of Q205, Q207
29B84489B01	TERMINAL, contact: for Q205, Q207
14K857437	INSULATOR, mounting: for Q205, Q207
14B84634C01	INSULATOR, shield for TB1

:ement diodes and transistors must be ordered by
ola part number only for optimum performance.

REVISIONS

63P81010E92-E

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4405A-1	C210	WAS 23D83214C15, 4.7 uF	Q208 COLLECTOR
	C212	ADDED .05 uF	Q206 EMITTER
	R215	WAS 6S129233; 47 OHMS	Q208 COLLECTOR
	R216	WAS 6S129662; 180 OHMS	Q208 COLLECTOR
TLN4405A-2		CHANGED OUTPUT LEAD COLORS AS FOLLOWS: BRN WAS BRN-YEL WHT-BLK WAS YEL-BLK GRN WAS YEL-GRN WHT-BLU WAS YEL-BLU WHT-RED WAS YEL-RED WHT-BRN WAS YEL-BRN	CIRCUIT BOARD

PARTS LIST

TPN1084A Power Supply (120-Volt, 60 Hz)
TPN1088A Power Supply (120-, 220-, 240-Volt, 50/60 Hz)

PL-1104-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF; ±10%; 50 V; unl. stated
C201	23D82304B16	5000 +150-10%; 35 V
C202	23D82304B16	5000 +150-10%; 35 V
C203	23D82304B16	5000 +150-10%; 35 V
C204	23D82304B16	5000 +150-10%; 35 V
C205	23D83214C15	4.7 ±20%; 25 V
C206	23D82601A08	25 +150-10%; 50 V
C207	8D82905G02	.022 ±10%; 50 V
C208	21D82428B10	.0033 ±10%; 100 V
C209	21D82428B10	.0033 ±10%; 100 V
C210	23D83214C07	22 ±20%; 15 V
C211	21C82372C05	0.2 +80-20%; 25 V
C212	21C82372C04	.05 +80-20%; 25 V
C213	23D83210C19	500 +100-10%; 20 V
C214	21D82428B10	.0033; 100 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR201	48C82732C10	silicon
CR202	48C82732C10	silicon
CR203	48C82732C07	silicon
CR204	48C82732C07	silicon
CR205	48D84242C01	silicon; controlled type
CR206	48D82392B03	silicon
CR207	48D82392B03	silicon
CR208	48D83696E01	silicon; Zener type; 6.8 V
CR209	48D82392B03	silicon
CR210	48D84755H01	silicon; controlled type
CR211	48D82392B03	silicon
CR212	48D83696E05	silicon; Zener type; 16.0 V
		FUSE, cartridge: 1-1/4" x 1/4";
F201	65S52293	5 A; 250 V
F202	65S4637	20 A; 32 V
		CONNECTOR, receptacle:
J201		includes: 14C83783A04 BODY, connector 29C82336A01 TERMINAL, contact
		CONNECTOR, plug:
P201		(part of W201)
		TRANSISTOR: (SEE NOTE)
Q201	48R869641	P-N-P; type M9641
Q202	48R869170	N-P-N; type M9170
Q203	48R869170	N-P-N; type M9170
Q204	48R869485	P-N-P; type M9485
Q205	48R869639	N-P-N; type M9639
Q206	48R869571	P-N-P; type M9571
Q207	48R869639	N-P-N; type M9639
Q208	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R201	6S129860	56
R202	6S129232	3.9K
R203	6S129861	68
R204	6S127800	220
R205	6S6269	820; 1/2 W
R206	17D82177B08	200; 5 W
R207	6S127802	1K
R208	18D82035B07	variable: 500 ±20%; 1 W
R209	6S129235	1.2K
R210	6S129754	33
R211	6S129235	1.2K
R212	6S127802	1K
R213	6S127800	220
R214	6S128685	22K
R215	6S131594	27
R216	6S129620	560
R217	6S5593	470; 1 W
R218	6S129662	180
R219	17C84377C01	0.1; 7 W
R220	17C84377C01	0.1; 7 W
R221	6S131524	100 ±5%
R222	6S124A21	68 ±5%
R223	6S124A39	390 ±5%
		TRANSFORMER, power:
T201	25D84112C01	pri: BLK-WHT, BLK; res 1.3 ohms: sec; RED, RED; res .033 ohm (TPN1084A only)
	or25D84638C01	pri; GRN, BRN with pri No. 1; GRN, BRN with YEL tap, ori No. 2; BLK/WHT, BLK total res 4.9 ohms sec; RED, RED res 0.035 ohms (TPN1088A only)
		TERMINAL BOARD:
TB1	31A898341	4 terminals
		CABLE ASSEMBLY, power:
W201	30C83211C05	consists of a 3-conductor cable ("zip cord") and a "molded-on" 3-contact male plug (P201); each conductor No. 18 ga., str; length overall 9 ft.
		FUSEHOLDER:
XF201	9C82083C03	extractor post type
XF202	9B83909E01	wafer type
		SOCKET, transistor:
XQ203	9C83662A01	2-contact
		NON-REFERENCED ITEMS
	14A865854	INSULATOR, mounting for CR205
	4K801846	WASHER, insulating; for CR205; 2 required
	4C82418B90	WASHER, insulating; for CR201, CR202, CR203, CR204
	14A83575A01	INSULATOR, mounting for Q203
	38K10388	BUTTON, plug
	7A83959A01	PLATE, heat sink; 2 required; for CR201 thru 204
	14A83168H01	INSULATOR, plate mounting for insulating CR201, CR203 mounting plate
	14A83967A03	WASHER, insulating; for CR201 thru 204; 4 required
	4B82345A13	WASHER, insulating; for terminals of Q205, Q207
	29B84489B01	TERMINAL, contact: for Q205, Q207
	14K857437	INSULATOR, mounting: for Q205, Q207
	14B84634C01	INSULATOR, shield for TB1

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

MOTOROLA

12-VOLT DC-ONLY CABLE KIT

MODEL TLN4546A

1. DESCRIPTION

The dc-only cable kit is used in place of the ac power supply in those installations where only dc operation is required.

A receptacle on the cable kit mates with the station intercabling to provide the necessary power for operation. An in-line fuse holder protects the unit should a short occur.

2. INSTALLATION

As shipped from the factory, the cable kit is connected to the station intercabling power plug, and coiled in the left side of the chassis. A beige plate and an envelope with mounting hardware are taped to the chassis below the coiled cable.

Installation consists of routing the cable through the plate from the inside, and inserting the feedthrough cable clamp from the outside. The plate mounts vertically from the inside of the chassis to cover the hole through which the heat sink of the power supply would protrude in ac powered units. It is secured using two of the self-tapping screws provided.

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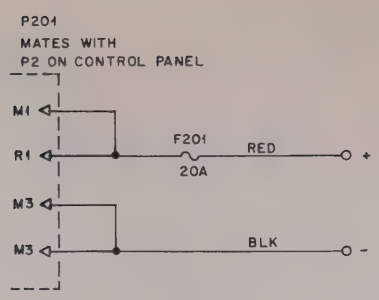
Issue - O



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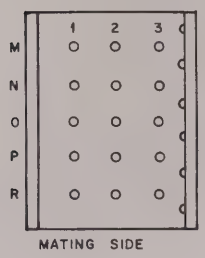

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN4546A "DC Only Option" Kit PL-2327-O

F201	65-4637	FUSE, cartridge: 1-1/4" x 1/4" 20 A; 32 V
P201		CONNECTOR, plug: includes: 14-83783A04 BODY: 15-contact type 29-82336A01 TERMINAL, contact: female 29-840421 SLEEVE, electrical splicing: solderless type; insulated 15-83934A13 SHELL 37-83159 GROMMET, rubber
W201	30-858553	CABLE, power: No. 12; stranded; coded RED; 33" length required
W202	30-858553	No. 12; stranded; coded RED; 85" length required
W203	30-858552	No. 12; stranded; coded BLK; 120" length required
XF201		FUSEHOLDER: "in-line" type; includes: 14-82882A01 BODY 14-82883A01 CAP 42-82884A01 TERMINAL, contact; 2 required 41-82885A01 SPRING
NON-REFERENCED ITEMS		
	29-832116	LUG, ring-tongue: 2 required
	64-84682C01	PANEL, cable entrance
	54-83331B07	LABEL, fuseholder

TLN4546A 12-Volt DC Cable
Schematic Diagram
Motorola No. AEPS-11225-O
2/7/73-UP

MOTOROLA
DESK MICROPHONE

MODELS TMN1004A & TMN1005A

AEPS-9464-O

1. DESCRIPTION

Models TMN1004A and TMN1005A Desk Microphones are designed to be used with consoles, base stations, and other similar equipment. Both models contain preamplifier circuitry and a dual-action TRANSMIT switch. Model TMN1005A also contains a dual-action MONITOR switch. This switch is used when the desk microphone is employed in conjunction with equipment having provision for coded squelch operation. When the switch is actuated the coded squelch feature is disabled, allowing the operator to monitor the channel before transmitting. Both the TRANSMIT and MONITOR switches are mounted to allow easy operation when the microphone is either hand-held or used on a desk.

All electrical components are mounted on a single printed circuit board vertically mounted in the housing, with cartridge at the top and the switch(es) at the bottom. For connection to external equipment, a 9-foot stranded cord with spade-lug terminations is routed out through the back at the base of the housing.

2. FUNCTIONAL OPERATION

The desk microphone (see diagram PEPS-9463) consists of a cartridge-type transducer, a three-stage preamplifier, and a switching circuit. Cartridge MK1 converts sound energy into electrical energy which is then amplified by preamplifier Q1 through Q3. The preamplifier output level is determined by the setting of potentiometer R1. This is a factory setting and normally does not require readjustment.

Models TMN1004A and TMN1005A Desk Microphones each contain TRANSMIT switch S1 which has three sets of contacts. The preamplifier output and the operating voltage input are routed through one set of these contacts. The microphone output is connected to the equipment through jumper JU1, which bypasses these contacts. In equipment configurations that use parallel microphones or other local equipment connected to the same microphone input, jumper JU1 is cut. This prevents loading of the microphone input circuit by the associated equipment. The second set of TRANSMIT switch contacts are used only if transmit monitor audio is desired at other parallel-connected dispatch points when the local microphone is being used. When the TRANSMIT switch is activated, this set of contacts opens the input to the local speaker but does not disable any of the parallel-connected dispatch point speakers. The third set of TRANSMIT switch contacts provide the P-T-T function. When the TRANSMIT switch is activated, this

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Issue - E

set of contacts applies an enabling ground to the P-T-T circuits in the equipment to which the microphone is connected. When the P-T-T circuits are enabled, the preamplifier output is processed by the external equipment.

In systems that utilize the coded squelch feature, FCC regulations require that a channel be monitored to be sure it is clear before initiating a transmission. Model TMN1005A Desk Microphone contains MONITOR switch S2 to accomplish this function. When the MONITOR switch is activated, the coded squelch feature is disabled allowing the operator to monitor a channel before transmitting. If jumper JU2 is cut, the operator then must activate both the MONITOR & TRANSMIT switches to initiate a transmission.

3. INSTALLATION

a. Jumper Configuration

Before connecting the desk microphone to external equipment, verify that printed circuit board jumpers JU1 and JU2 configuration are correct for the system in which the microphone is to be used. Microphones are shipped from the factory with both jumpers installed. The jumpers are removed to obtain the following conditions:

--Jumper JU1 is removed when parallel microphones or other local equipment are connected at the same microphone input.

--Jumper JU2 (Model TMN1005A only) is removed when it is necessary to prevent an operator from transmitting without first monitoring a channel to verify it is clear. With JU2 removed, both the MONITOR and TRANSMIT switches must be activated before transmitting.

When it is necessary to change the microphone jumper configuration, perform the following procedures to gain access to the jumpers.

NOTE

Refer to Figure 1 for location of front cover screws and jumpers JU1 and JU2.

(1) At the rear of the microphone, remove the four screws that secure the front cover to the the housing; then remove the front cover.

(2) As necessary, arrange the microphone jumpers to obtain the desired configuration.

(3) Replace the front cover by slipping the lower edge under the switch buttons.

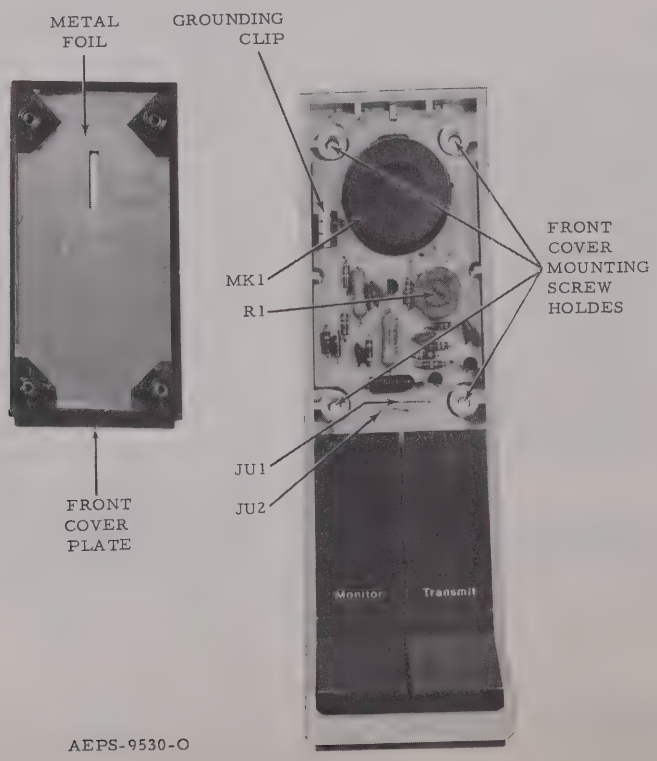

Figure 1.
Printed Circuit Board Access

NOTE

When the front cover is in place, be sure that the grounding clip spring fingers are contacting the metal foil on the inside of the front cover (Figure 1).

(4) While holding the front cover in place, secure it to the housing by replacing the four screws.

b. Microphone Connections

The desk microphone is connected to external equipment through a 9-foot stranded cord with spade lug terminations. As necessary, refer to applicable equipment manuals to determine the correct connection terminals. Refer to Table 1 for microphone lead functions.

Table 1. Microphone Leads and Functions

Lead Color	Function
Brown	Microphone High
Shield	Microphone Low
Green	P-T-T
White	Monitor
Black	Ground
Yellow*	Speaker Audio Hot
Red*	Speaker Audio Mute

*Used only when transmit monitor is desired at parallel-connected dispatch points when microphone is transmitting.

4. OPERATION

a. General Microphone Procedure

To assure good audio transmission quality, observe the following general microphone practices.

(1) Keep microphone approximately 8 inches away from the mouth. (The distance may vary depending on the user's tone of voice.)

(2) Speak clearly, and directly into the microphone, at a normal conversational level.

b. TRANSMIT Switch

When pressed and held, the dual-action TRANSMIT switch causes the associated transmitter to be keyed.

NOTE

If jumper JU1 is cut and intercom operation is required, the operator must press both the intercom button on the associated equipment and the TRANSMIT button on the microphone.

c. MONITOR Switch

The MONITOR switch (Model TMN1005A only), when activated, allows the operator to monitor a channel to be sure it is clear before transmitting. In systems using coded squelch, this feature is an FCC requirement. If jumper JU2 has been removed, the operator must press and hold both the MONITOR and TRANSMIT switches before he can transmit. Releasing either switch ends the transmission.

The MONITOR switch is a dual-action switch which operates in the same manner as the TRANSMIT switch.

5. MAINTENANCE

a. Printed Circuit Board Removal

(1) At the rear of the microphone, remove the four screws that secure the front cover to the housing; then remove the front cover (Figure 1).

(2) On the bottom of the microphone, remove the four screws that secure the baseplate to the housing; then remove the baseplate (Figure 2).

(3) Remove the shaft retainer clip from the pivot shaft (Figure 3).

(4) Remove cord strain relief from U-shaped slot (Figure 2).

(5) Slide both halves of the pivot shaft toward the center releasing shaft from retaining holes (Figure 2).

(6) Swing lower edge of printed circuit board (including switches) forward to disengage the upper portion from the housing (Figure 2); then remove printed circuit board.

b. Printed Circuit Board Replacement

(1) Engage the upper portion of the printed circuit board in the housing at an angle of the housing (Figure 2).

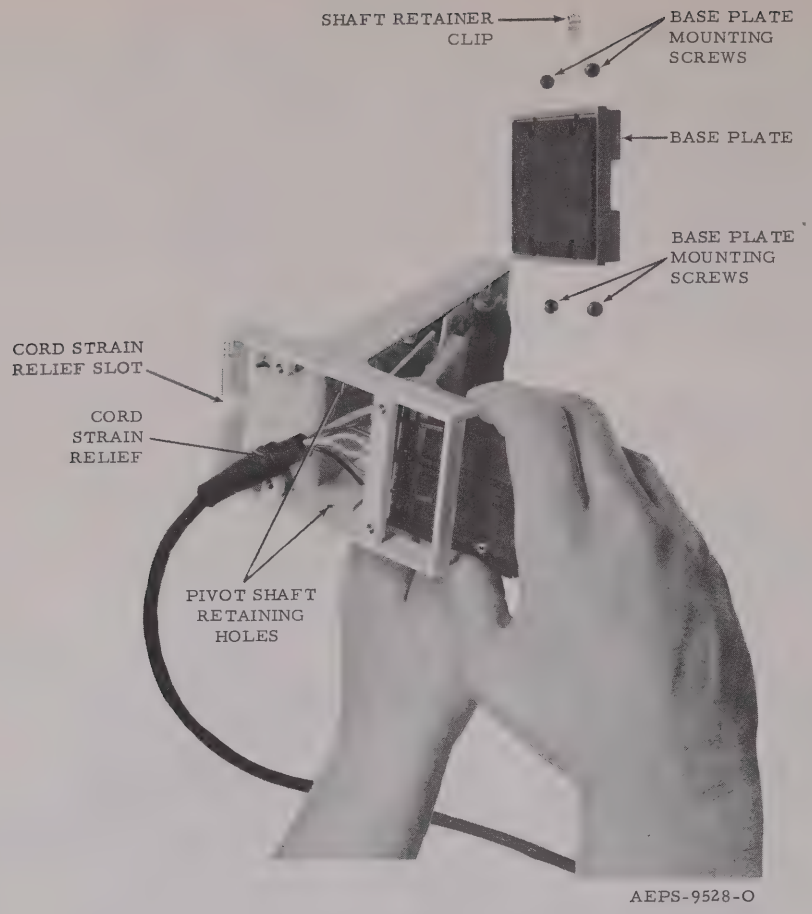

Figure 2.
Microphone Disassembly Detail

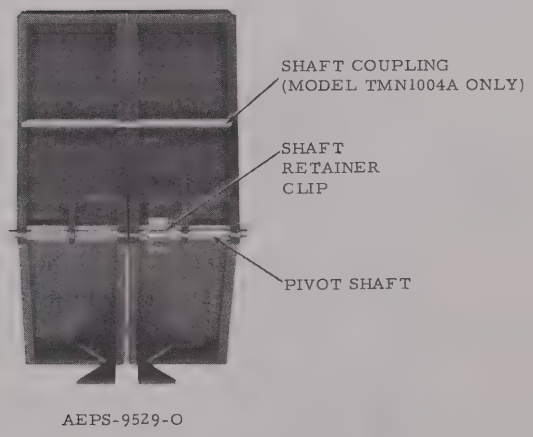

Figure 3.
Pivot Shaft Detail

NOTE

When the front cover is in place, be sure that the grounding clip spring fingers are contacting the metal foil on the inside of the front cover (Figure 1).

(4) While holding the front cover in place, secure it to the housing by replacing the four screws.

b. Microphone Connections

The desk microphone is connected to external equipment through a 9-foot stranded cord with spade lug terminations. As necessary, refer to applicable equipment manuals to determine the correct connection terminals. Refer to Table 1 for microphone lead functions.

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4. OPERATION

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When pressed and held, the dual-action TRANSMIT switch causes the associated transmitter to be keyed.

NOTE

If jumper JU1 is cut and intercom operation is required, the operator must press both the intercom button on the associated equipment and the TRANSMIT button on the microphone.

c. MONITOR Switch

The MONITOR switch (Model TMN1005A only), when activated, allows the operator to monitor a channel to be sure it is clear before transmitting. In systems using coded squelch, this feature is an FCC requirement. If jumper JU2 has been removed, the operator must press and hold both the MONITOR and TRANSMIT switches before he can transmit. Releasing either switch ends the transmission.

The MONITOR switch is a dual-action switch which operates in the same manner as the TRANSMIT switch.

5. MAINTENANCE

a. Printed Circuit Board Removal

(1) At the rear of the microphone, remove the four screws that secure the front cover to the housing; then remove the front cover (Figure 1).

(2) On the bottom of the microphone, remove the four screws that secure the baseplate to the housing; then remove the baseplate (Figure 2).

(3) Remove the shaft retainer clip from the pivot shaft (Figure 3).

(4) Remove cord strain relief from U-shaped slot (Figure 2).

(5) Slide both halves of the pivot shaft toward the center releasing shaft from retaining holes (Figure 2).

(6) Swing lower edge of printed circuit board (including switches) forward to disengage the upper portion from the housing (Figure 2); then remove printed circuit board.

b. Printed Circuit Board Replacement

(1) Engage the upper portion of the printed circuit board in the housing at an angle of the housing (Figure 2).

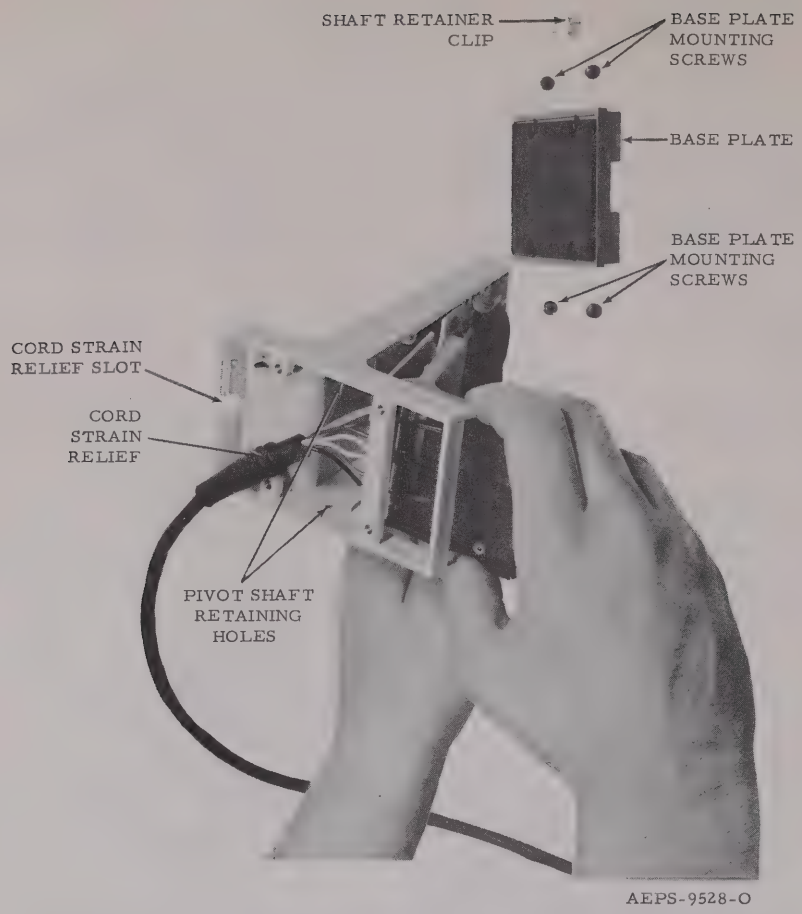


Figure 2.
Microphone Disassembly Detail

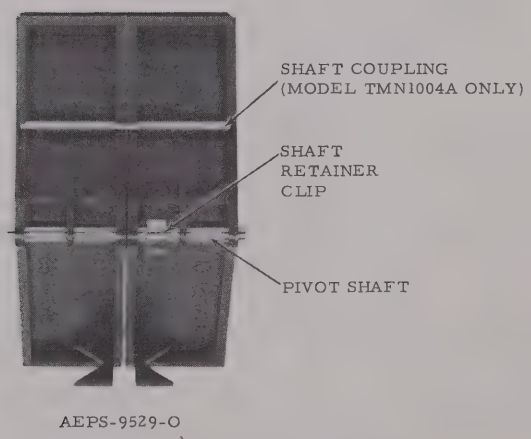


Figure 3.
Pivot Shaft Detail

(2) Swing the lower portion of the printed circuit board toward the rear of the housing (Figure 2).

(3) Position both halves of pivot shaft so the shaft ends engage the retaining holes (Figure 2).

(4) Replace shaft retainer clip (Figure 3).

(5) Replace cord strain relief in U-shaped slot (Figure 2).

(6) Replace baseplate and secure with the four screws (Figure 2).

(7) Replace front cover by slipping the lower edge under the switch buttons (Figure 1).

NOTE

When the front cover is in place, be sure that the ground clip spring fingers are contacting the metal foil on the inside of the front cover (Figure 1).

(8) While holding the front cover in place, secure it to the housing using the four screws.

c. Testing

(1) Test Equipment Required

(a) S1063B Motorola Solid-State DC Multimeter (or equivalent).

(b) S1053C Motorola Solid-State AC Voltmeter (or equivalent).

(c) S1331A Motorola Solid-State Oscilloscope (or equivalent).

(2) Test Procedure

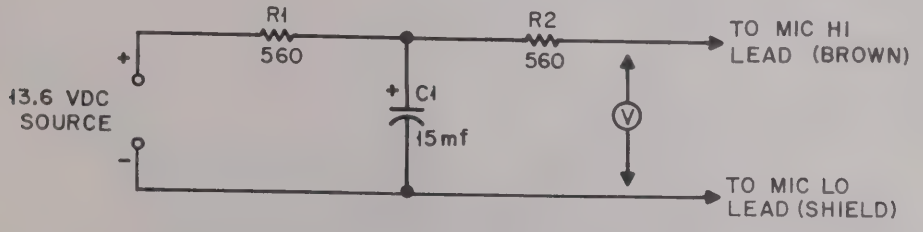
NOTE

Potentiometer R1 is factory set and field adjustment is not required.

The microphone can be tested either while connected to its associated equipment or to the test setup as shown in Figure 4. Basic testing consists of checking resistances and dc voltages against the schematic diagram. Dynamic testing can be accomplished by speaking into the microphone and using an oscilloscope or ac voltmeter to monitor the amplification (gain) of the various stages. However, since a known dynamic input signal for field testing is not practicable, gain measurements are to be used only as indications of proper stage functioning. For that reason, no ac voltages are provided on the schematic.

6. REFERENCE DIAGRAMS

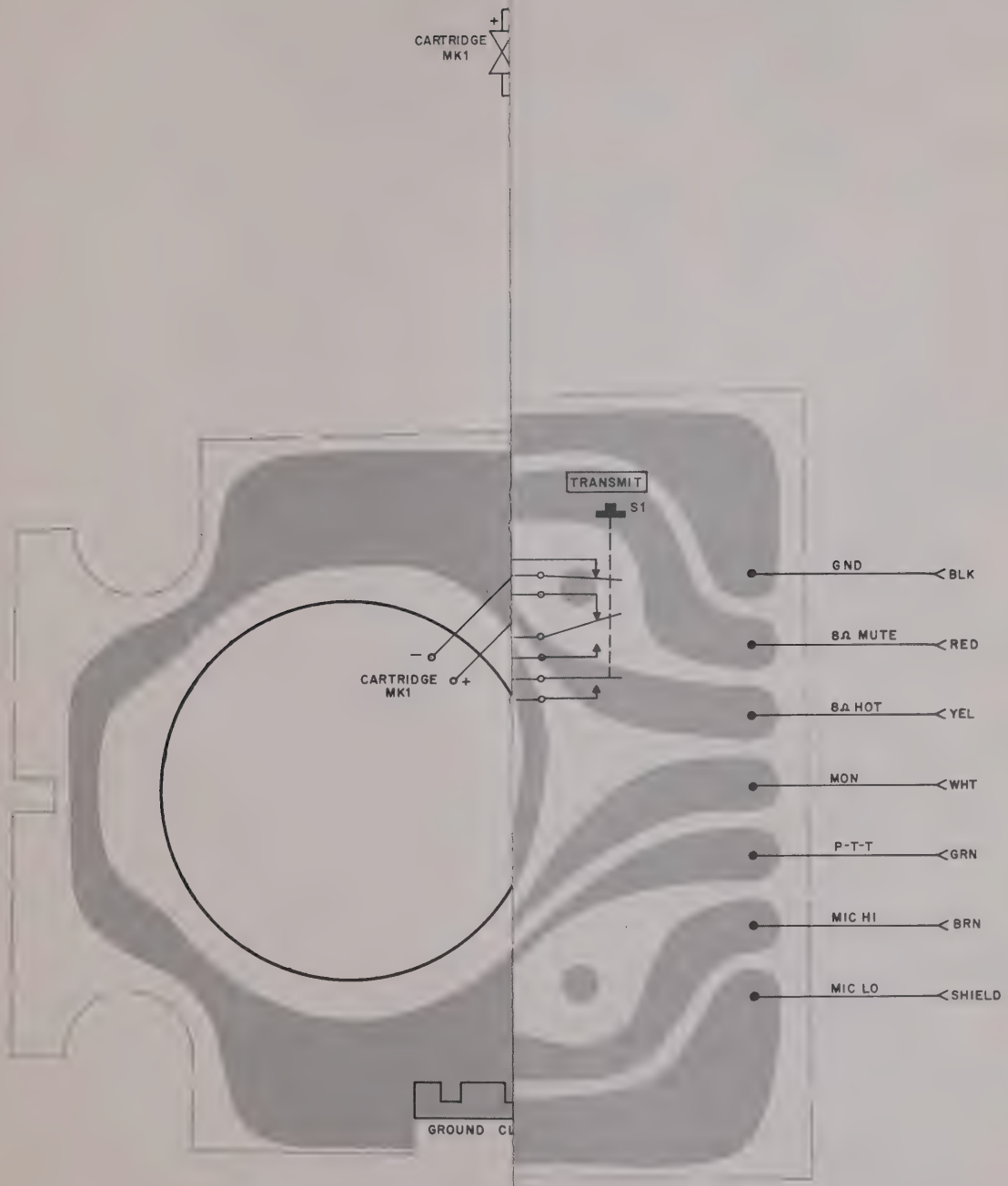
TMN1004A & TMN1005A Desk Microphone Schematic Diagram & Circuit Board Detail . . . PEPS-9463



AEPS-9531-O

Figure 4.
Test Setup

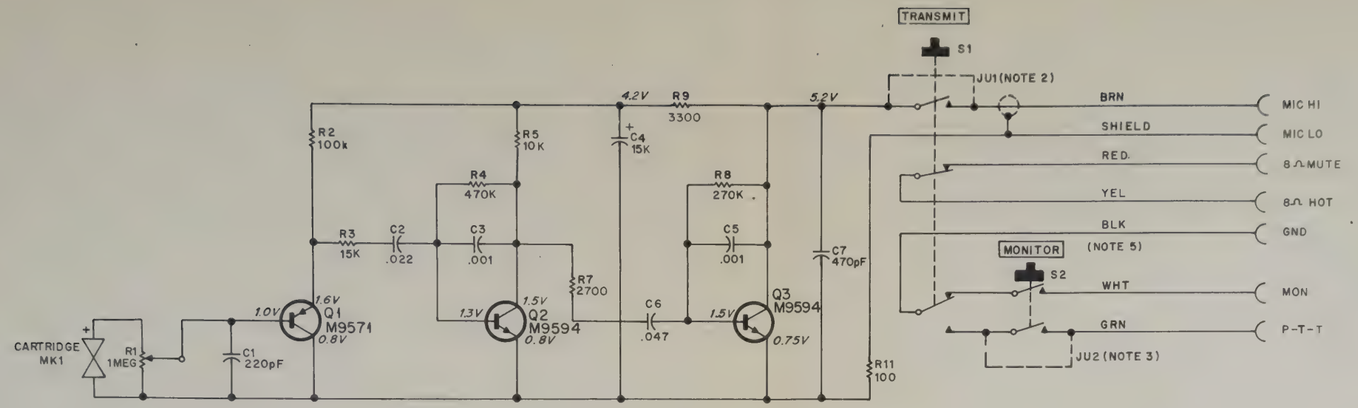
DESK MICROPHONE



PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

TMN1004A-2 & TMN1005A-2 Desk Microphone
Schematic Diagram & Circuit Board Detail
Motorola No. PEPS-9463-D
12/3/73-UP

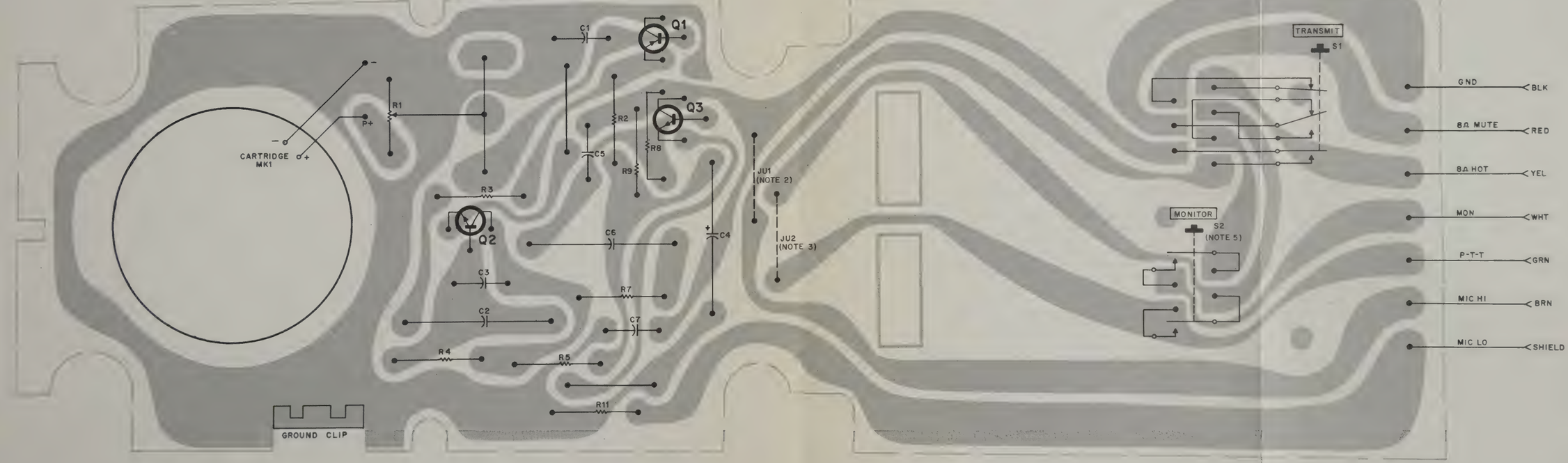
DESK MICROPHONE



NOTES:

1. UNLESS OTHERWISE STATED:
   ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. REMOVE JU1 FOR PARALLEL MIC OPERATION.
3. REMOVE JU2 FOR TO MONITOR BEFORE TRANSMIT.
4. ALL DC VOLTAGE READINGS ARE IN RESPECT TO THE MIC LO LEAD.
5. MONITOR SWITCH S2 IS PRESENT IN MODEL TMN1005A ONLY.

CEPS-9460-C



SHOWN FROM COMPONENT SIDE

TRANSISTOR DETAIL

BD-DEPS-9461-D
OL-DEPS-9462-B

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

TMN1004A-2 & TMN1005A-2 Desk Microphone
Schematic Diagram & Circuit Board Detail
Motorola No. PEPS-9463-D
12/3/73-UP

REVISIONS

PEPS-9463-D

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN4924A TLN4925A TMN1004A-1 (TLN4924A-1)	R6	REMOVED (WAS 6-131524, 100 ±5%; 1/4 W) WAS CONNECTED IN SERIES WITH EMITTER OF Q2	Q2 EMITTER
TMN1005A-1 (TLN4925A-1)	R10	REMOVED (WAS 6-124A01, 10 ±5%; 1/4 W) WAS CONNECTED IN SERIES WITH EMITTER OF Q3	Q3 EMITTER
TMN1004A-2 (TLN4924A-2)	R4	FROM 6-124B06, 220k TO 6-124B14, 470k	Q2 COLLECTOR
TMN1005A-2 (TLN4925A-2)	R7	FROM 6-127804, 4.7k TO 6-129707, 2.7k	

PARTS LIST

TLN4924A & TLN4925A Mike Circuit Board PL-1884-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%;
C1	21-82187B08	220 pF; 500 V
C2	8-82987E11	.022; 80 V
C3	21-82187B44	.001; 100 V
C4	23-84762H09	15; ±20%; 20 V
C5	21-82187B44	.001; 100 V
C6	8-82987E02	.047; 200 V
C7	21-82187B45	470 pF; 500 V
		CARTRIDGE, microphone:
MK1	59-84640E01	miniature
		TRANSISTOR: (SEE NOTE)
Q1	48-869571	P-N-P; type M9571
Q2, 3	48-869594	N-P-N; type M9594
		RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R1	18-83083G12	variable; 1 meg ±30%
R2	6-129226	100k
R3	6-127805	15k
R4	6-124B14	470k ±5%
R5	6-129668	10k ±5%
R7	6-129707	2.7k ±5%
R8	6-131858	270k ±5%
R9	6-129231	3.3k
R11	6-129753	100
		SWITCH, leaf:
S1, 2	40-84711E02	2 section, multiple nonlocking contacts (TLN4924A)
	40-84711E01	2 section, multiple nonlocking contacts (TLN4925A)
		NON-REFERENCED ITEMS
	5-84371E01	GROMMET, cartridge
	42-84724E01	CLIP, grounding
	3-136676	SCREW, switch mtg. 4-40 x 1/4 pnl hex

THN6154A & THN6155A Mike Housing & Hardware Kit PL-1885-O

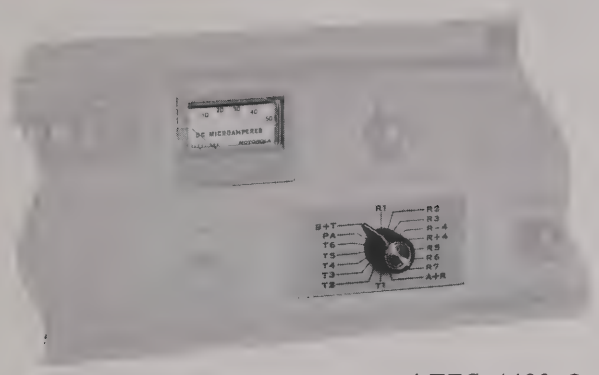
		NON-REFERENCED ITEMS
	1-80736B05	CABLE ASSEMBLY includes: 29-847854 LUG, slotted tongue; 7 req'd.
	15-84186E01	COVER, front
	15-84188E01	COVER, rear
	15-84191E01	HOUSING
	26-84720E01	FOIL, grounding, front cover
	26-84721E01	FOIL, grounding, rear cover
	38-84184E02	BUTTON, left hand (THN6154A)
	38-84184E01	BUTTON, left hand (THN6155A)
	38-84192E01	BUTTON, right hand
	42-84725E01	CLIP, retainer
	47-84193E01	SHAFT
	47-84194E01	SHAFT EXTENSION
	47-84723E01	SHAFT COUPLING (THN6154A only)
	64-84183E01	PLATE, base
	75-84722E01	PAD, base plate
	3-138809	BASE PLATE SCREW 4-40 x 5/16 phl bn hx bk ox
	3-138810	FRONT COVER SCREW 4-40 x 5/8 phl bn hx bk ox

NOTE:

Replacement transistors must be ordered by Motorola part number only for optimum performance.

DC METER

MODEL TLN4420A



AEPS-4433-O

DESCRIPTION

This unit provides built-in metering of the transmitter and receiver circuitry directly from the control panel. A 0-50 microampere meter and an eighteen-position rotary switch are used. The meter and switch permit measurement and selection of critical test points in all receiver and transmitter circuits. The specific circuits to be measured are connected to the meter via receptacles on the receiver and transmitter chassis. The meter is mounted in the front panel space reserved for a meter, so that either the dc meter or the vu meter may be used, but not both. The rotary switch is mounted on the front panel frame which is, in turn, fastened to the front panel.

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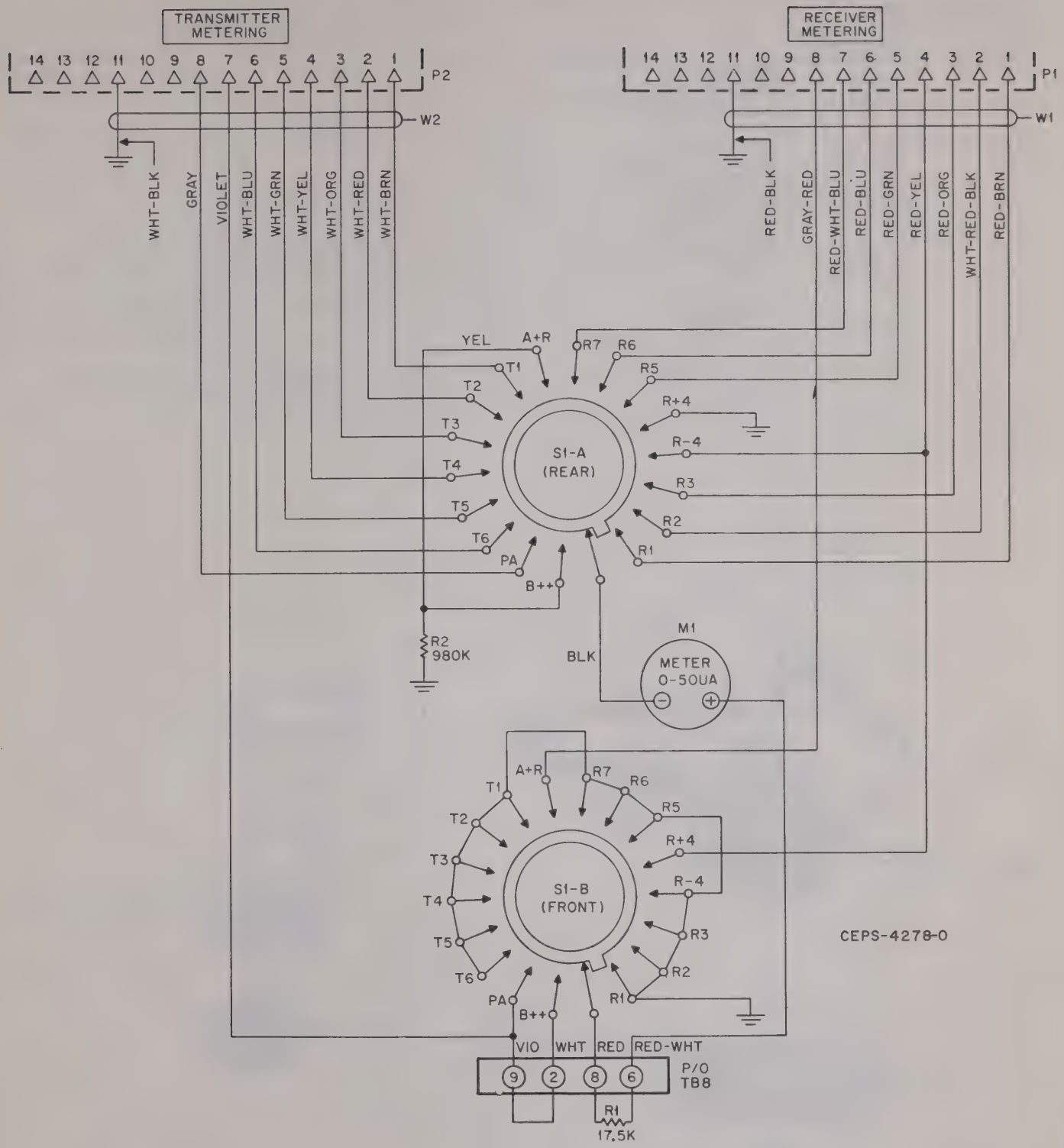


DC METER

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

DC Meter
Schematic Diagram
Motorola No. 63P81010E44-A
2/7/73-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

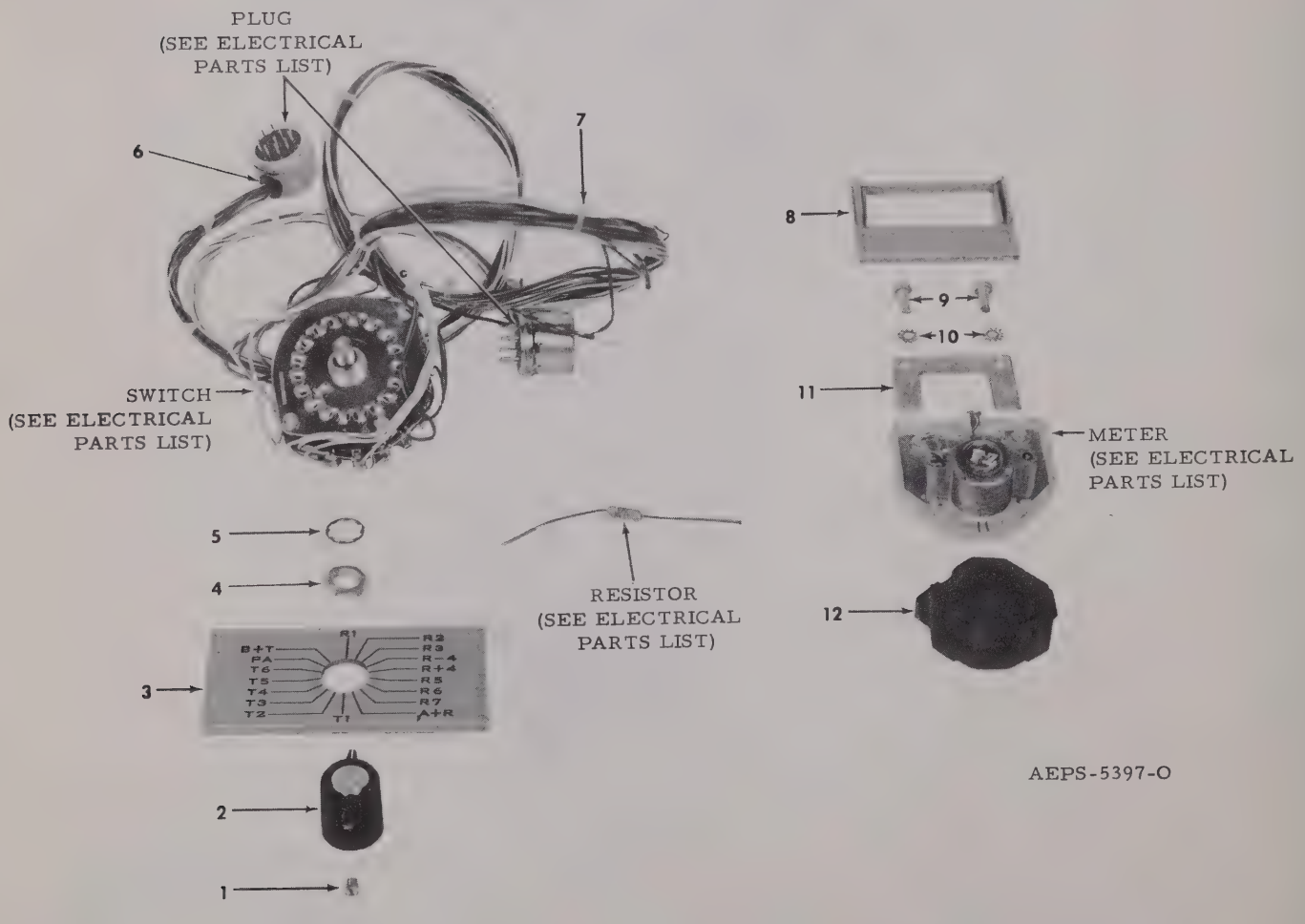
TLN4420A DC Metering Kit PL-1283-O

		AMMETER, DC;
M1	72C83319G01	0-50 microamperes; internal res. 2560 ohms ±10%
		CONNECTOR, plug;
P1	28B864669	male; 12 cont; does not incl. 15A82798H01 SHELL
P2	28B864669	male; 12 cont; does not incl. 15A82798H01 SHELL
		RESISTOR, fixed: 1/2 W;
R1	6K855337	17.5k ±2%
R2	6K811974	980k ±2%
		SWITCH, rotary:
S1	40C83106B01	2 section; each section single pole; 18 position; non-shorting
		CABLE ASSEMBLY, special purpose;
W1	1V80775A50	c/o misc. leads, laced
W2	1V80775A50	c/o misc. leads, laced

PARTS LIST

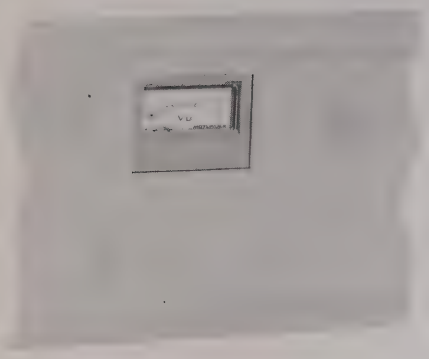
TLN4420A DC Metering Kit
MECHANICAL PARTS PL-1281-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	3S7104	SETSCREW: 8-32 x 3/16" headless; slotted drive (supplied with Item 2)
2	36B82630H01	KNOB, control; includes Item 1
3	64D83071G10	PANEL INSERT, switch mounting; includes legend
4	2S1376	NUT, machine; 3/8-32 x 1/2" hex
5	4S7691	LOCKWASHER; 3/8" internal type
6	37K10599	GROMMET, rubber
7	42S10217A02	STRAP, cable harness
8	64C83073G02	PANEL INSERT, meter mounting
9	3S3375	SCREW, tapping; 6-20 x 5/16" plain hex head
10	4S7666	LOCKWASHER: No. 6 external type
11	42B83155G01	CLIP, meter mounting
12	26C83747G01	COVER, meter



VU METER

MODEL TLN1368A



AEPS-4436-O

1. DESCRIPTION

The vu meter provides a relative indication of the speech level input to the transmitter exciter. The kit consists of a vu meter and circuit board. It is equipped with a variable attenuator which connects in parallel with the exciter audio input. The meter is mounted in the front panel space which is reserved for a meter. (Either the vu meter or the dc meter may be used, but not both). The circuit board which includes the variable attenuator, is mounted on the chassis below the receiver.

2. ADJUSTMENT

a. Remove the radio housing, then remove transmitter-receiver chassis to gain access to VU ADJ control on the meter board.

b. Disconnect the microphone audio lead at TB2-7.

c. Connect an audio oscillator to TB2-7 (mic high) and TB2-6 (mic low). A 5 uF capacitor should be in series with TB2-7 to provide dc isolation of the oscillator from the station.

An audio voltmeter should be connected in parallel with the oscillator at TB2-6 and TB2-7.

d. Turn the base station power switch ON.

e. Set the oscillator frequency to 1000 Hz and increase the amplitude until the ac voltmeter reads approximately 0.12 volt (3.0 kHz deviation).

f. Key the transmitter into a dummy load using the microphone, or by jumpering TB2-5 to the chassis.

g. Using a screwdriver, slowly adjust the VU ADJ (adjust) control for 0 on the VU meter.

h. Turn the power switch to OFF.

i. Reconnect the microphone audio lead to TB2-7.

j. Replace the transmitter/receiver chassis assembly.

k. Replace the housing and hand tighten the two knurled nuts at the rear.

l. Lock the housing and remove the key.

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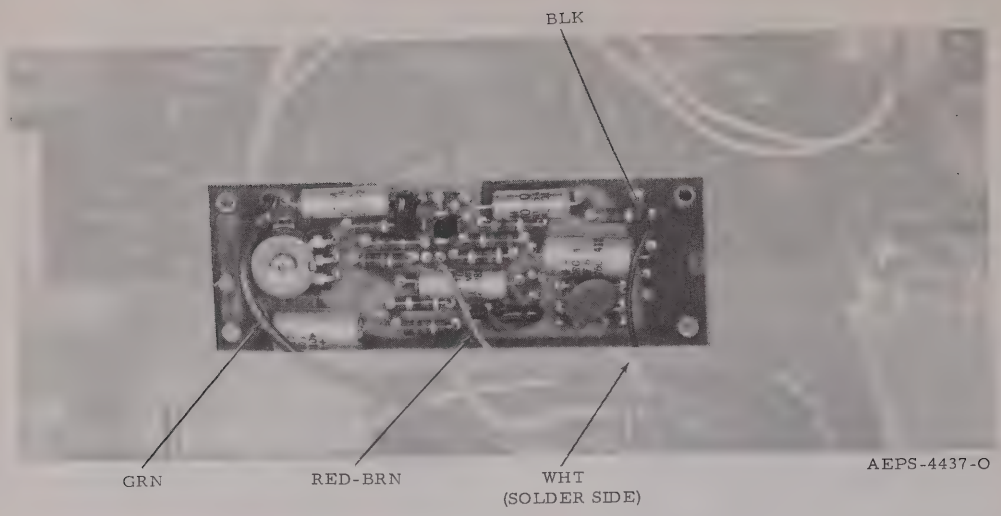
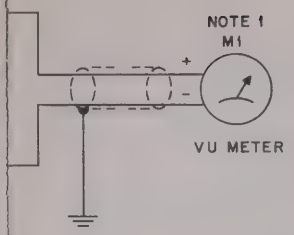
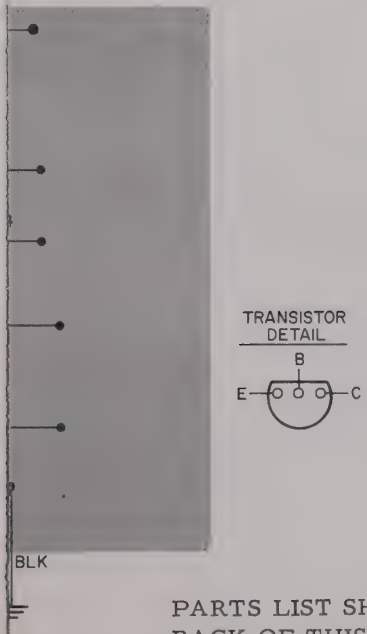


Circuit Board Location



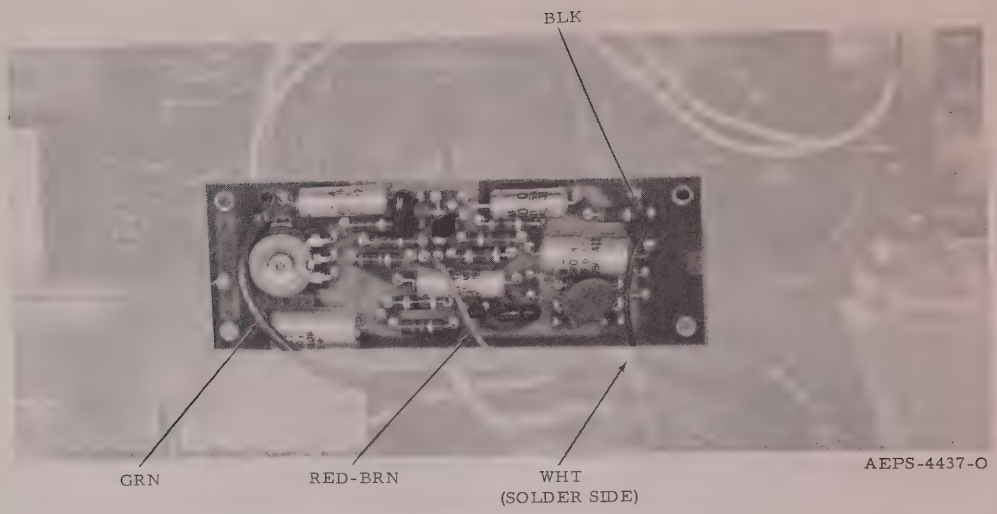
NOTE:

1. VU METER ON FRONT PANEL.

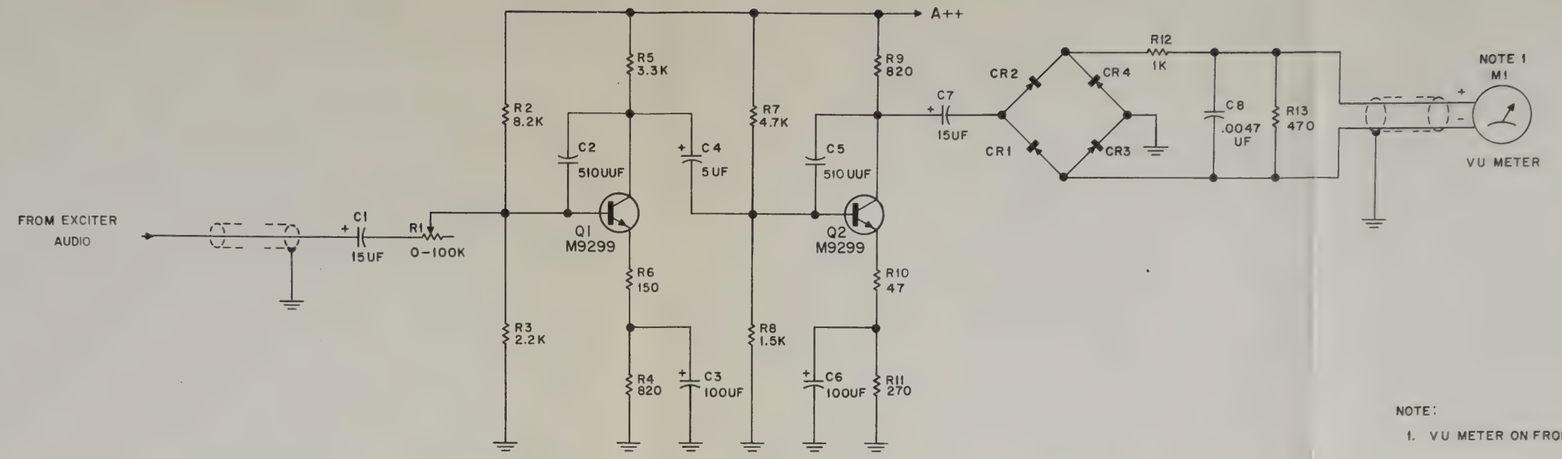


PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

VU Meter
Schematic Diagram and Circuit Board Detail
Motorola No. 63P81010E47-A
2/7/73-UP



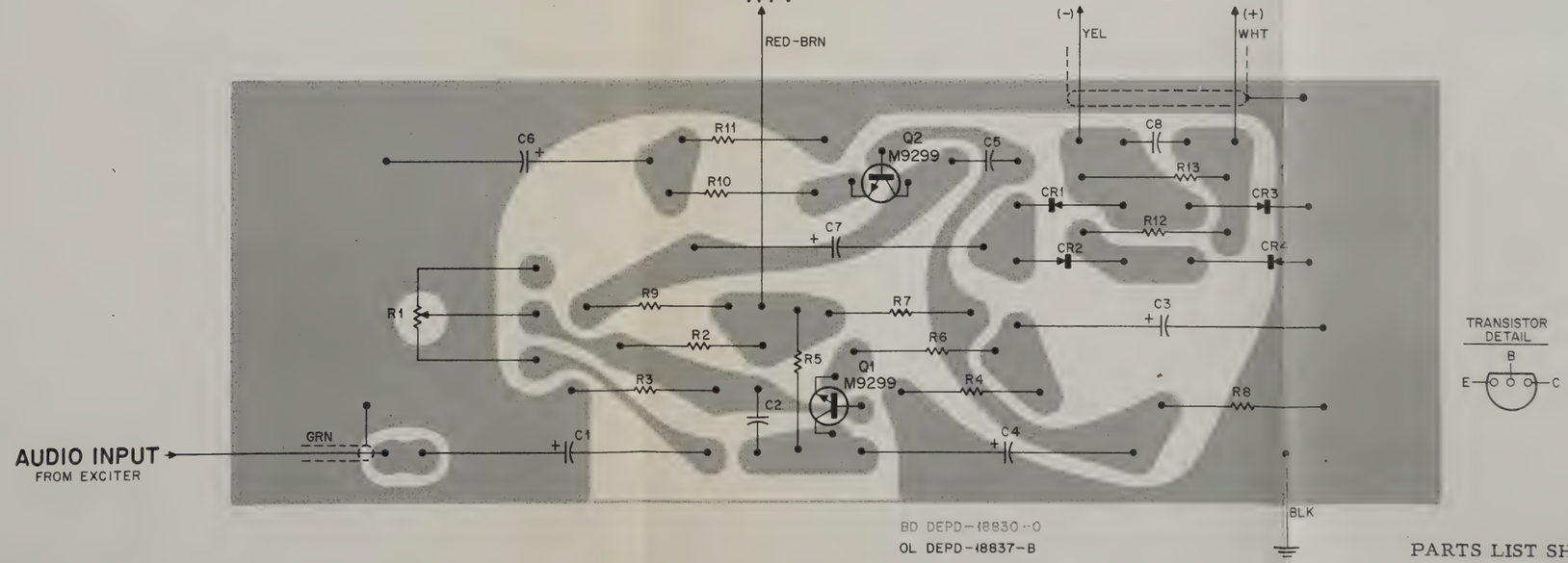
Circuit Board Location



NOTE:

1. VU METER ON FRONT PANEL.

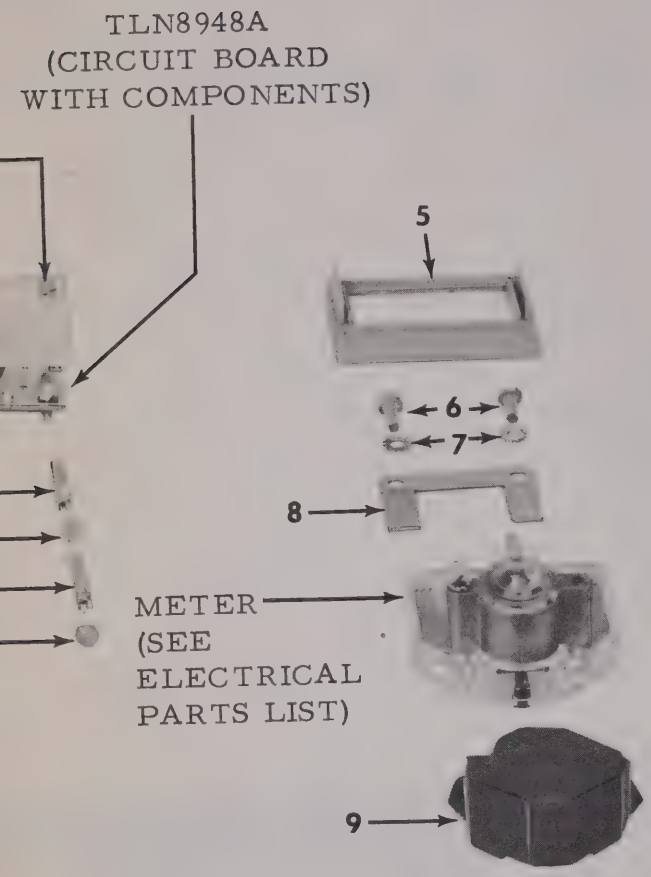
DEPD-18839-A



BD DEPD-18830-0
OL DEPD-18837-B

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

VU Meter
Schematic Diagram and Circuit Board Detail
Motorola No. 63P81010E47-A
2/7/73-UP


TLN8948A
(CIRCUIT BOARD
WITH COMPONENTS)
5
6
7
8
METER
(SEE
ELECTRICAL
PARTS LIST)
9

AEPS-5393-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN1368A VU Meter Kit PL-1106-O

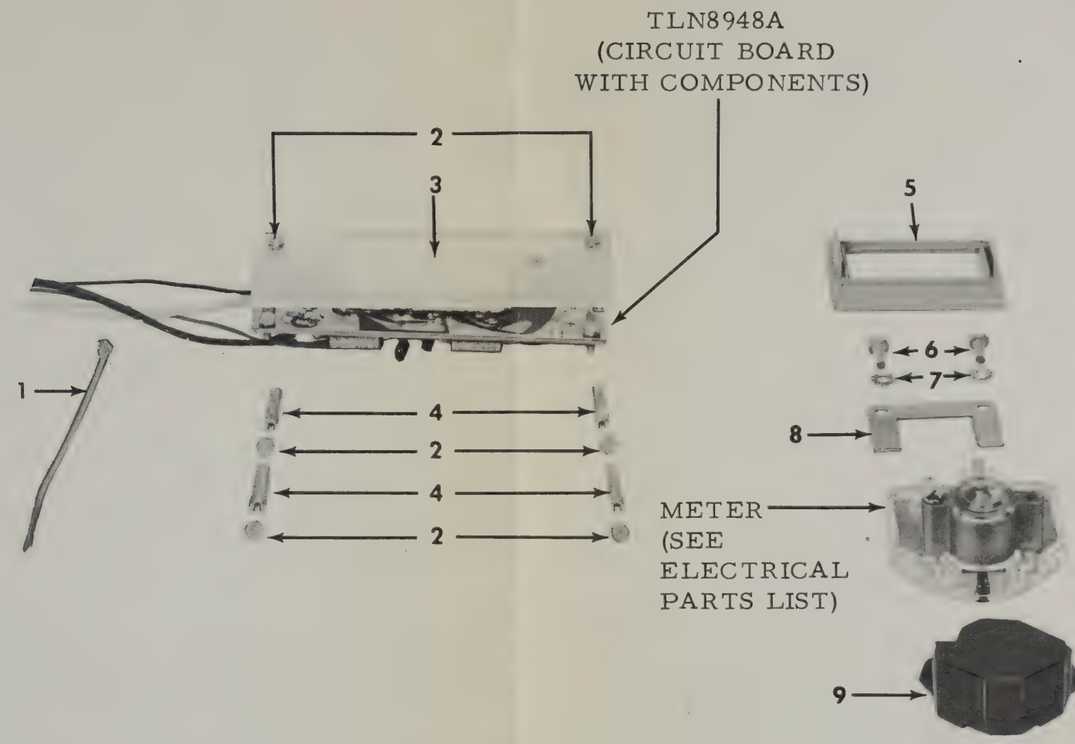
		CAPACITOR, fixed:
C1, 7	23D82601A31	15 uF +150-10%; 25 V
C2, 5	21K845214	510 pF ±5%; 300 V
C3	23D82601A12	100 uF +150-10%; 6 V
C4	23D82601A11	5 uF +33-10%; 25 V
C8	21D82428B27	.0047 uF ±10%; 100 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1, 2, 3, 4	48C82178A04	germanium
		METER, audio level:
M1	72C83270G01	-20 to +3 VU
		TRANSISTOR: (SEE NOTE)
Q1, 2	48R869299	N-P-N; type M9299
		RESISTOR, fixed: ±10%; 1/2 W unl. stated
R1	18D82338B13	var: 100K; 1/4 W
R2	6S2004	8.2K
R3	6S6069	2.2K
R4, 9	6S6269	820
R5	6S5531	3.3K
R6	6S6373	150
R7	6S6080	4.7K
R8	6S6038	1.5K
R10	6S5550	47
R11	6S6432	270
R12	6S6229	1K
R13	6S6090	470

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

TLN1368A VU Metering Kit
MECHANICAL PARTS PL-1275-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	42A10217A02	STRAP, cable harness
2	3S125790	SCREW, machine; 4-40 x 5/16" plain hex head (ext. lockw.)
3	14B84264C01	INSULATOR, circuit board
4	43A84115C03	STUD, circuit board mounting
5	64C83073G02	PANEL INSERT, meter mounting
6	3S3375	SCREW, tapping; 6-20 x 5/16" plain hex head
7	4S7666	LOCKWASHER; No. 6 external type
8	42B83155G01	CLIP, meter mounting
9	26C83747G01	COVER, meter



AEPS-5393-O

ALERT TONE OSCILLATOR

MODEL TLN1369A

AEPD-20047-A

1. DESCRIPTION

The alert tone oscillator provides a 1000 Hz tone that can be used as a signal prior to actual voice transmission or as a test tone when adjusting the deviation of a transmitter. The kit consists of a transistorized oscillator, a switch, the cabling required for circuit interconnections and the hardware for mounting to the front panel.

2. OPERATION

To transmit the alert tone, press and hold the ALERT TONE switch. The tone will be transmitted as long as the switch is held in. Release the switch to stop the tone.

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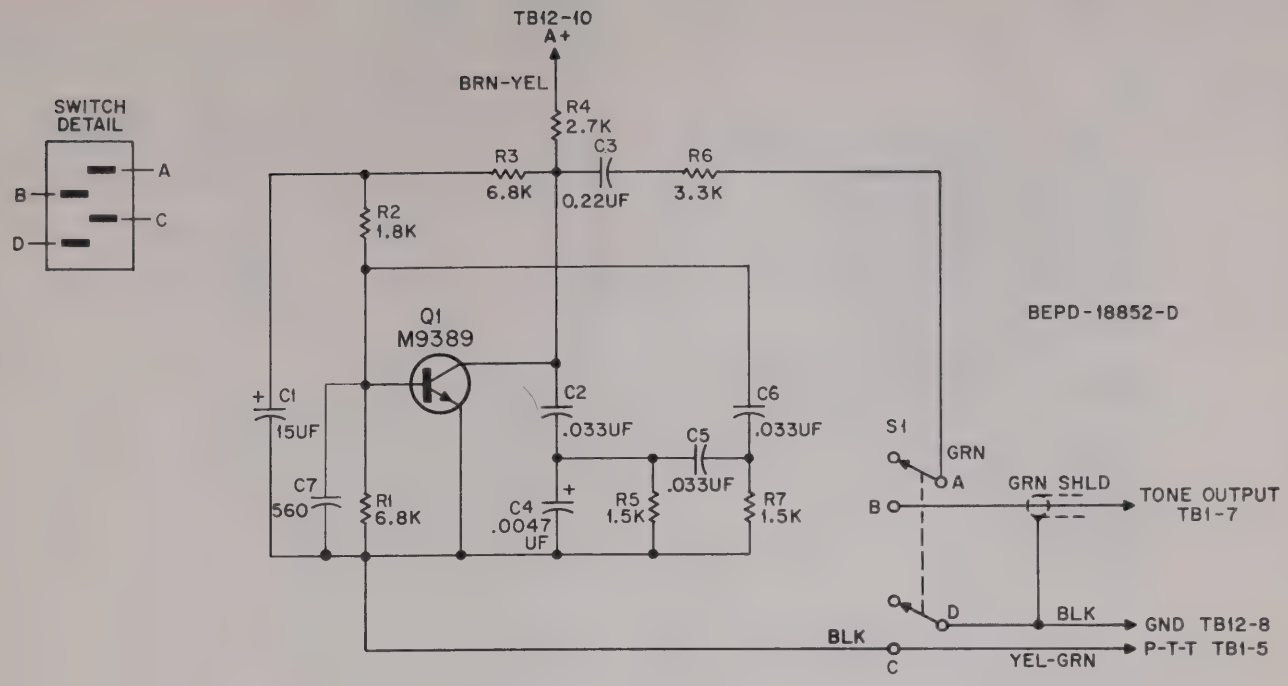
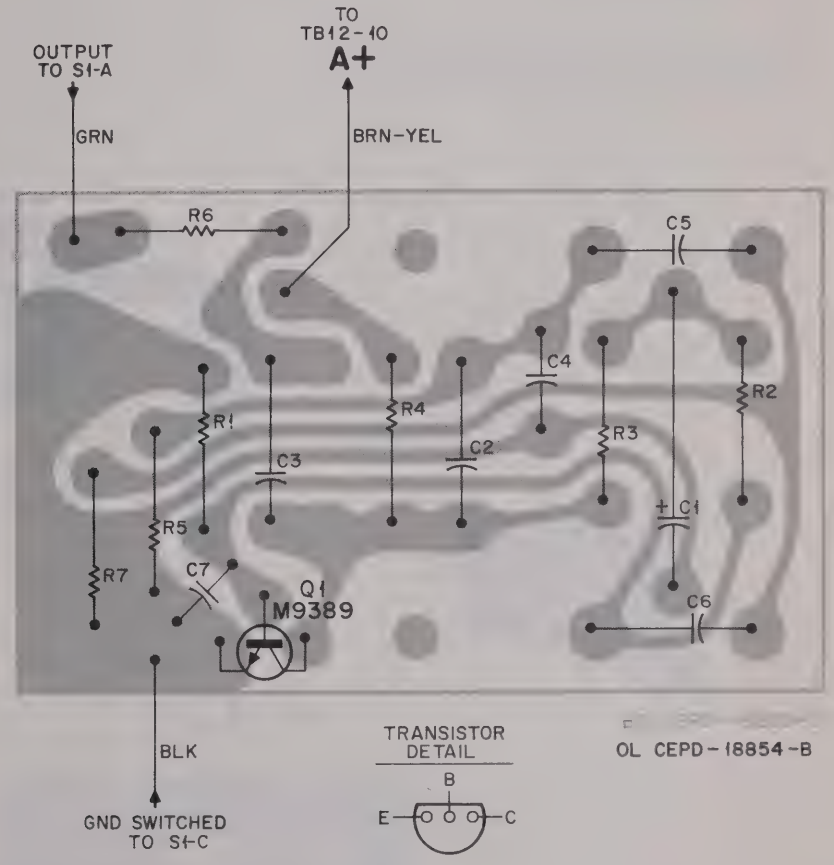




PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Alert Tone Oscillator
Schematic Diagram and Circuit Board Detail
Motorola No. 63P81010E57-A
2/7/73-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN1369A Alert Tone Kit PL-1286-O

		CAPACITOR, fixed:
C1	23D83214C02	15 uF ±20%; 25 V
C2	8D82905G08	.033 uF ±10%; 50 V
C3	8D82905G11	0.22 uF ±10%; 50 V
C4	21D82428B27	.0047 uF ±10%; 100 V
C5	8D82905G08	.033 uF ±10%; 50 V
C6	8D82905G08	.033 uF ±10%; 50 V
C7	21C82187B06	560 pF ±10%; 50 V
		TRANSISTOR: (SEE NOTE)
Q1	48R869389	N-P-N; type M9389
		RESISTOR, fixed: ±10%; 1/4 W;
R1	6S128687	6.8k
R2	6S129269	1.8k
R3	6S128687	6.8k
R4	5S128688	2.7k
R5	6S127803	1.5k
R6	6S129231	3.3k
R7	6S127803	1.5k
		SWITCH, lever:
S1	40C83303G03	dpst; 2-position; non-locking

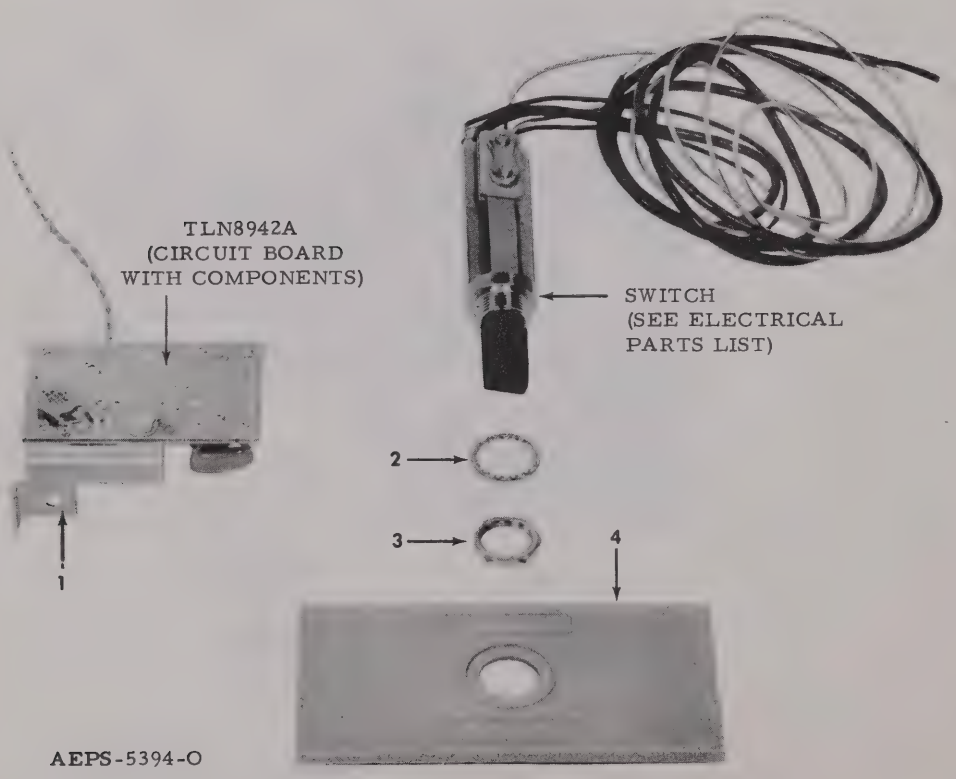
NOTE:

Replacement transistors must be ordered by Motorola part number only for optimum performance.

PARTS LIST

TLN1369A Alert Tone Kit
MECHANICAL PARTS PL-1276-O

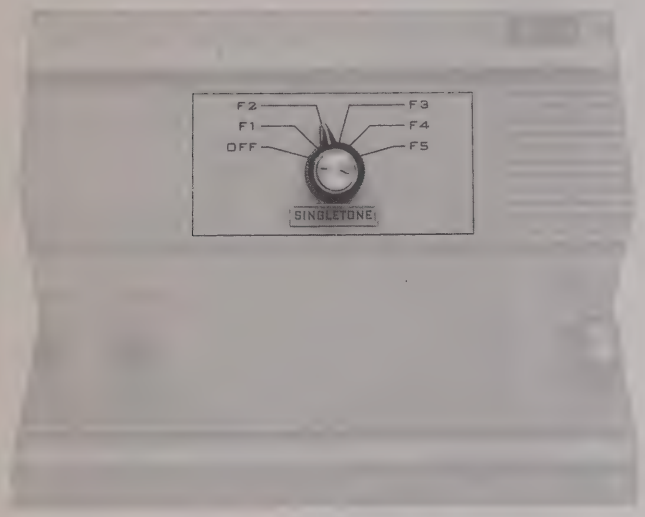
CODE	MOTOROLA PART NO.	DESCRIPTION
1	7B84109C01	BRACKET, circuit board mounting
2	4S8424	LOCKWASHER; 15/32" internal type
3	2S115190	NUT, machine; 15/32-32 x 9/16" hex
4	64D83071G01	PANEL INSERT, switch mounting



AEPS-5394-O

SINGLE-TONE ENCODER

MODELS TLN1371A AND TLN1371AV



AEPS-3727-O

Front Panel View

1. INTRODUCTION

The multiple frequency single-tone encoder provides a selective tone for base-to-mobile selective calling, and provides remote switching functions for control of standby equipment.

Models with an "AV" suffix are the same as those with an "A" suffix except non-standard frequencies are used.

The oscillator may be used to tone-alert a receiving station to a pertinent incoming call, or the associated receiver station may incorporate a tone decoder unit, which will complete the audio output circuit. Thus, only the receiver(s) for which the call was intended will receive the message. Also a tone decoder equipped receiver can energize an external control circuit for repeater or alarm systems. The unit provides up to five tones which may be individually selected.

A six-position selector switch is used to select one of the tone frequencies or to turn "off" the tone transmission. The transistorized oscillator circuit is on a printed circuit board mounted inside the control console or base station.

2. DESCRIPTION

An oscillator is used to generate a fixed duration audible tone when the P-T-T button is pressed. This tone modulates the rf carrier and is transmitted to the receiver.

The oscillator circuitry consists of two transistors, a tapped coil, and a fixed capacitor. The frequencies are selected by switching the capacitor across the taps of the coil. By using jumper connections, the tone frequencies for F1, F2, F3, F4 and F5 can be arranged in any desirable order.

The output of the oscillator is fed to an amplifier. The amplifier output can be jumper selected for three levels of deviation. The output impedance can also be jumper selected for operation into a high or low impedance.

Grounding the P-T-T function activates a multivibrator which gates the oscillator on. The time the oscillator is on (tone duration) is controlled by jumper selections which provide durations of 0.5, 0.7, 1.0, and 1.5 seconds. If a longer tone duration is required, JU5 may be replaced with a resistor. Any resistance value

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up to 27K may be used. This will provide a maximum three-second tone duration. This resistance value must not be exceeded. Refer to the jumper chart on the tone encoder schematic for all jumper details.

3. PERFORMANCE SPECIFICATIONS

Tone Frequency Range	1350 Hz to 1950 Hz	
Power Input	+13.8 V dc	
Tone Duration	Approx. 0.5, 0.7, 1.0, and 1.5 seconds	
Output*	Pin Terminal Connection	Meter Indication
	High	Not more than 140 mV
	Medium	Not more than 40 mV
	Low	Not more than 20 mV

*Output specifications indicated for a transmitter input impedance of approximately 560 ohms.

Specifications subject to change without notice.

The standard tone frequencies in "A" suffix models are as follows:

F1 = 1950 Hz
F2 = 1800 Hz
F3 = 1650 Hz
F4 = 1500 Hz
F5 = 1350 Hz

4. ADJUSTMENT

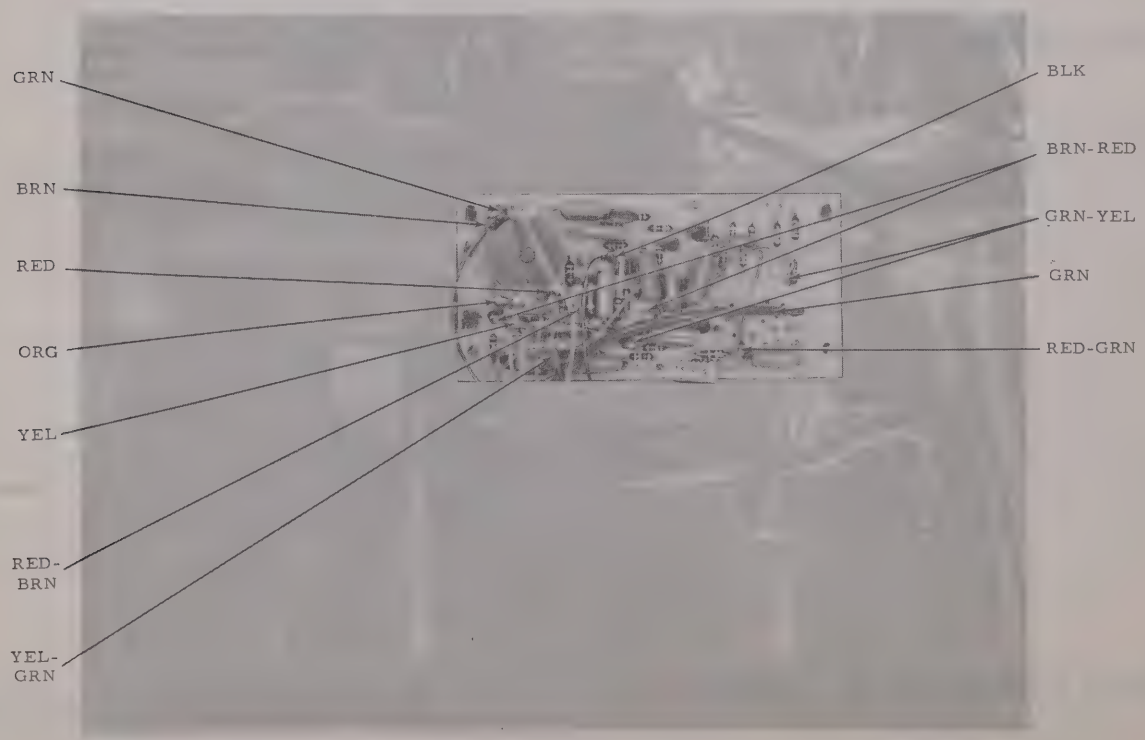
A level adjustment is usually unnecessary as the decoders in the receiving station operate over a wide range of deviation. However, if the oscillator fails to operate, check first to make sure all jumper options and external connections are properly made. Check to see that the unit is oscillating and then make the following tone level check:

With a clip lead jumper connected across resistor R23 (for continuous tone operation during adjustment) turn the radio set "on". The output control may then be set for proper deviation.

With deviation monitoring equipment, check the deviation caused by the tone modulation. This value should be approximately 50% of the maximum allowable deviation (maximum allowable deviation is ±5 kHz). If it is less than 30% or more than 90%, adjust the pin terminal jumper on the oscillator printed circuit board for the desired deviation.

5. SERVICE

Complete removal of the circuit board for access to the components is not necessary. The board can be folded away from the chassis to expose the components. If it is necessary to disconnect leads from the circuit board, observe standard servicing procedures such as tagging leads and identifying connecting points. Refer to the photograph and to the circuit board detail for aid in lead identification.

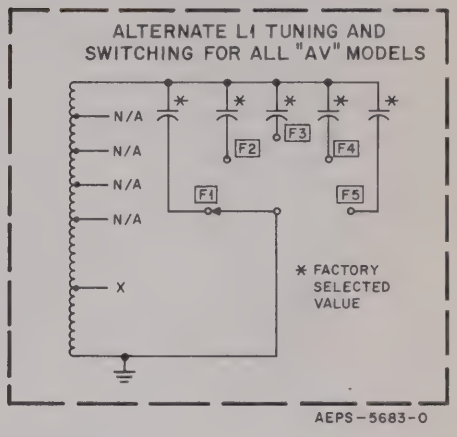


Circuit Board Location

NOTES:

1. JUMPER SELECTED OPTION. FACTORY SET FOR 1.5 SEC.
2. JUMPER SELECTED OPTION. FACTORY SET FOR MED. OUTPUT.

EPS-3970-B



JUMPER CHART

JUMPER	STATUS	APPLICATION
JU1	IN	LOCAL AND EXTENDED LOCAL
JU2	OUT	CONTROL "COMPA-STATIONS"
JU3	IN	"MOTRAC" AND "MOCOM"
JU4	IN	"CONSOLETTE" BASE STATIONS
JU5	IN*	

*REPLACE WITH A RESISTOR WHEN TONE DURATIONS GREATER THAN 1.5 SECONDS ARE REQUIRED.

EPS-8021-A

Y
PUT
OVEL
PER
R

B
G

SINGLE TONE ENCODER

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

TLN1371A and TLN1371AV
Single-Tone Encoder
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E72-C
2/7/73-UP

up to 27K may be used. This will provide a maximum three-second tone duration. This resistance value must not be exceeded. Refer to the jumper chart on the tone encoder schematic for all jumper details.

3. PERFORMANCE SPECIFICATIONS

Tone Frequency Range	1350 Hz to 1950 Hz	
Power Input	+13.8 V dc	
Tone Duration	Approx. 0.5, 0.7, 1.0, and 1.5 seconds	
Output*	Pin Terminal Connection	Meter Indication
	High	Not more than 140 mV
	Medium	Not more than 40 mV
	Low	Not more than 20 mV

*Output specifications indicated for a transmitter input impedance of approximately 560 ohms.

Specifications subject to change without notice.

The standard tone frequencies in "A" suffix models are as follows:

F1 = 1950 Hz
F2 = 1800 Hz
F3 = 1650 Hz
F4 = 1500 Hz
F5 = 1350 Hz

4. ADJUSTMENT

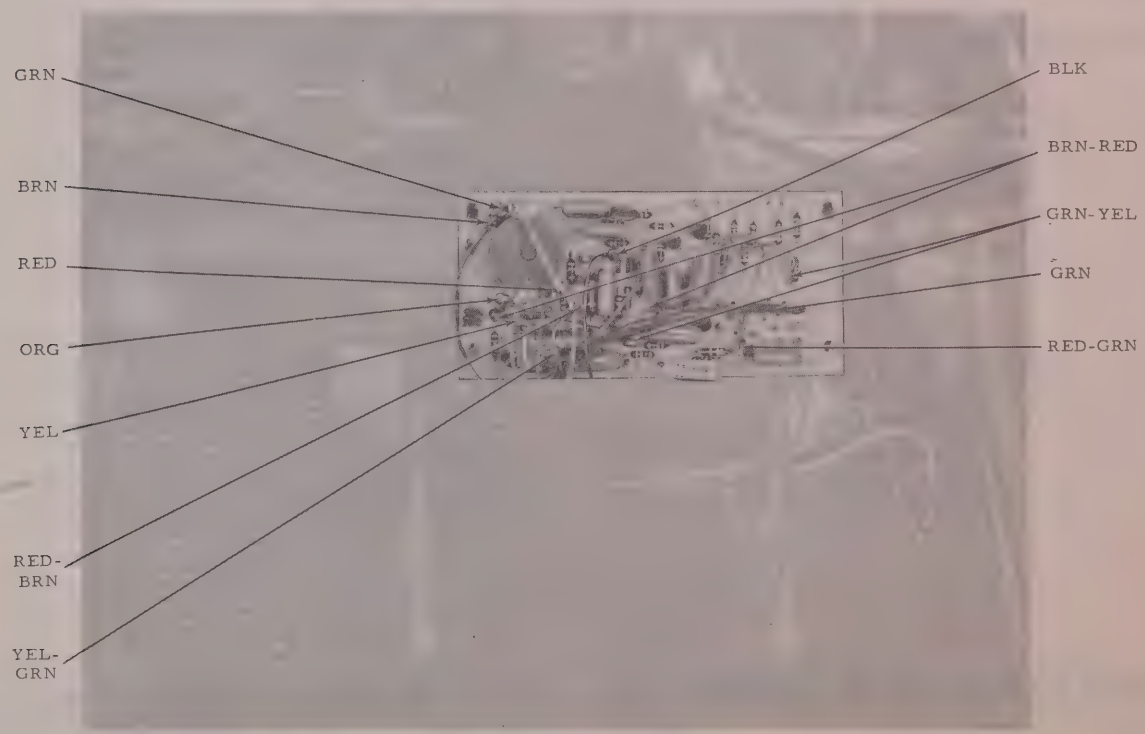
A level adjustment is usually unnecessary as the decoders in the receiving station operate over a wide range of deviation. However, if the oscillator fails to operate, check first to make sure all jumper options and external connections are properly made. Check to see that the unit is oscillating and then make the following tone level check:

With a clip lead jumper connected across resistor R23 (for continuous tone operation during adjustment) turn the radio set "on". The output control may then be set for proper deviation.

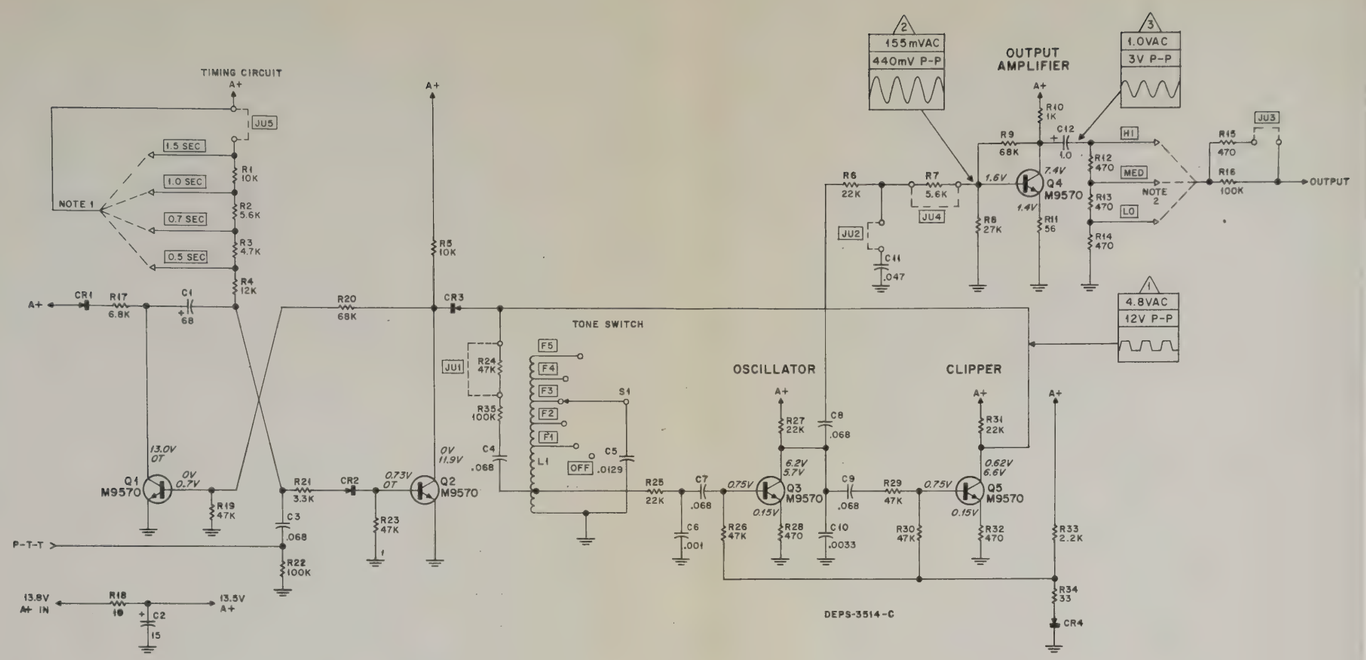
With deviation monitoring equipment, check the deviation caused by the tone modulation. This value should be approximately 50% of the maximum allowable deviation (maximum allowable deviation is ±5 kHz). If it is less than 30% or more than 90%, adjust the pin terminal jumper on the oscillator printed circuit board for the desired deviation.

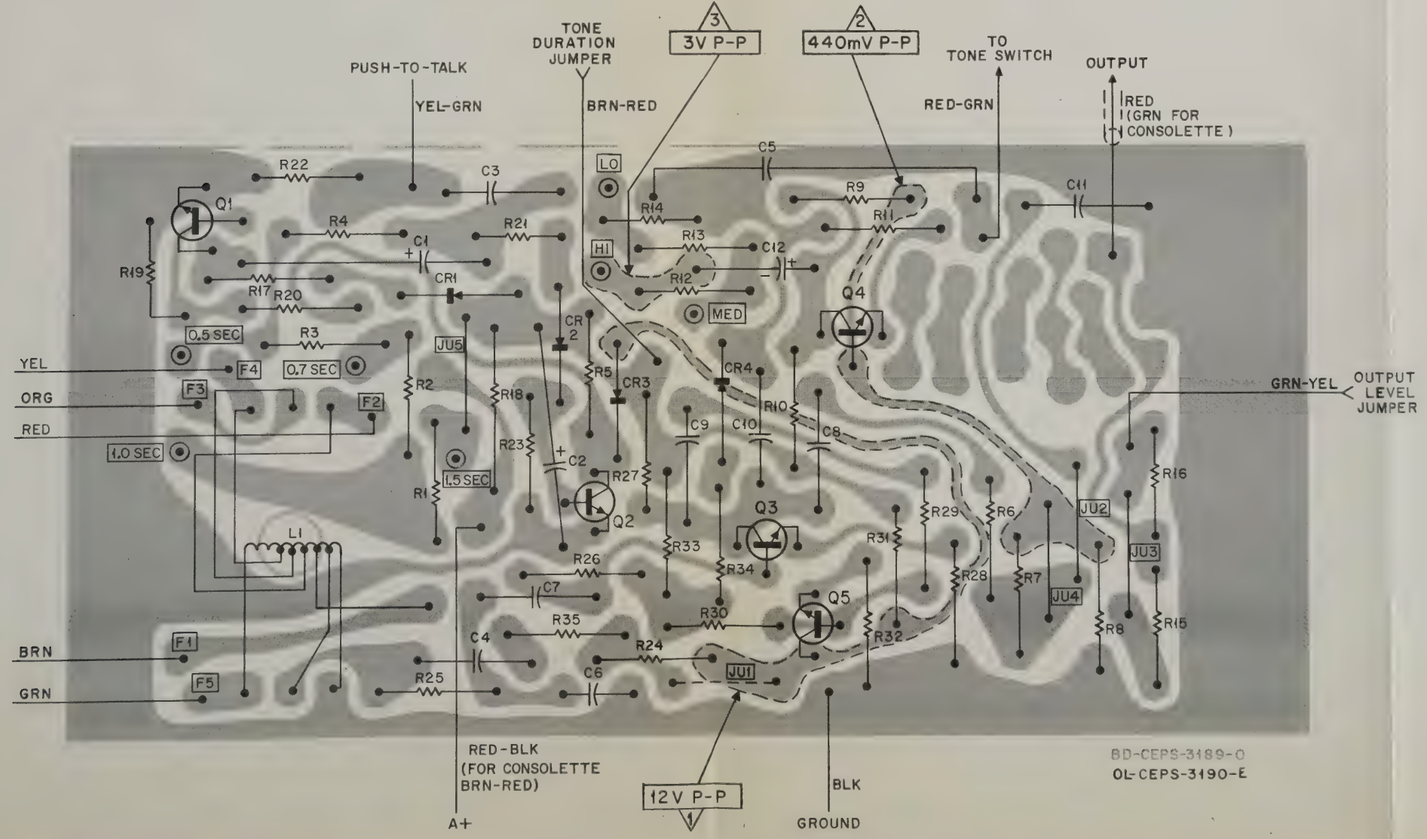
5. SERVICE

Complete removal of the circuit board for access to the components is not necessary. The board can be folded away from the chassis to expose the components. If it is necessary to disconnect leads from the circuit board, observe standard servicing procedures such as tagging leads and identifying connecting points. Refer to the photograph and to the circuit board detail for aid in lead identification.



Circuit Board Location

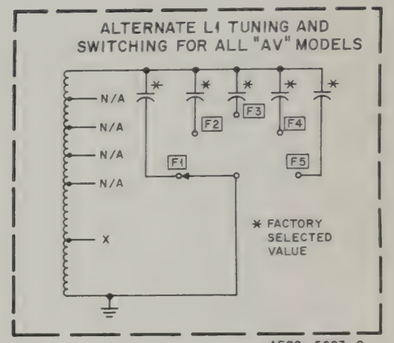




NOTES:

1. JUMPER SELECTED OPTION. FACTORY SET FOR 1.5 SEC.
2. JUMPER SELECTED OPTION. FACTORY SET FOR MED. OUTPUT.

EPS-3970-B



AEPS-5683-O

JUMPER CHART

JUMPER	STATUS	APPLICATION
JU1	IN	LOCAL AND EXTENDED LOCAL
JU2	OUT	CONTROL "COMPA-STATIONS"
JU3	IN	"MOTRAC" AND "MOCOM"
JU4	IN	"CONSOLETTE" BASE STATIONS
JU5	IN*	

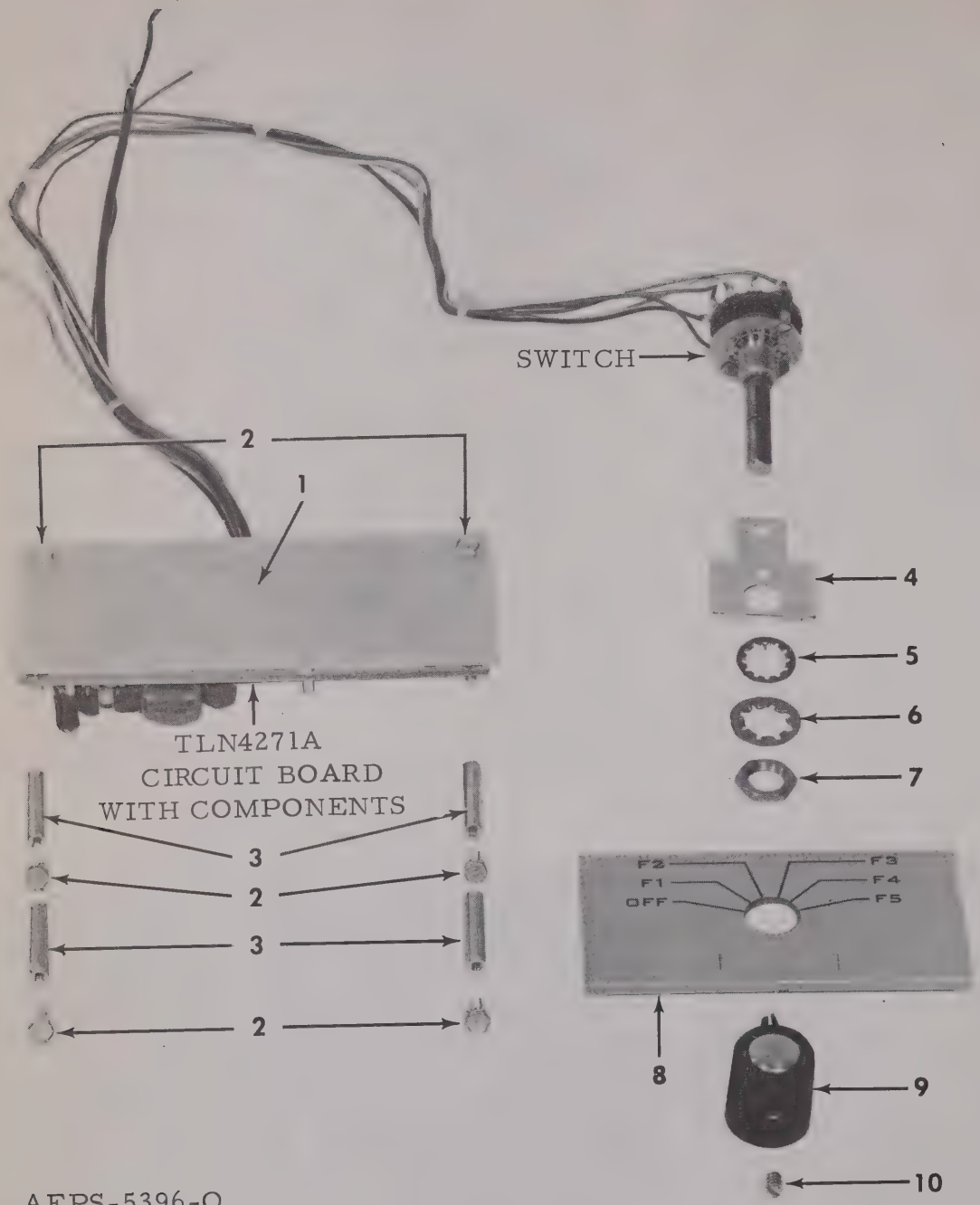
*REPLACE WITH A RESISTOR WHEN TONE DURATIONS GREATER THAN 1.5 SECONDS ARE REQUIRED.

EPS-8021-A

SINGLE TONE ENCODER

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

TLN1371A and TLN1371AV
Single-Tone Encoder
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E72-C
2/7/73-UP


SWITCH
2
1
TLN4271A
CIRCUIT BOARD
WITH COMPONENTS
3
2
3
2
4
5
6
7
F2
F3
F1
F4
OFF
F5
8
9
10

AEPS-5396-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

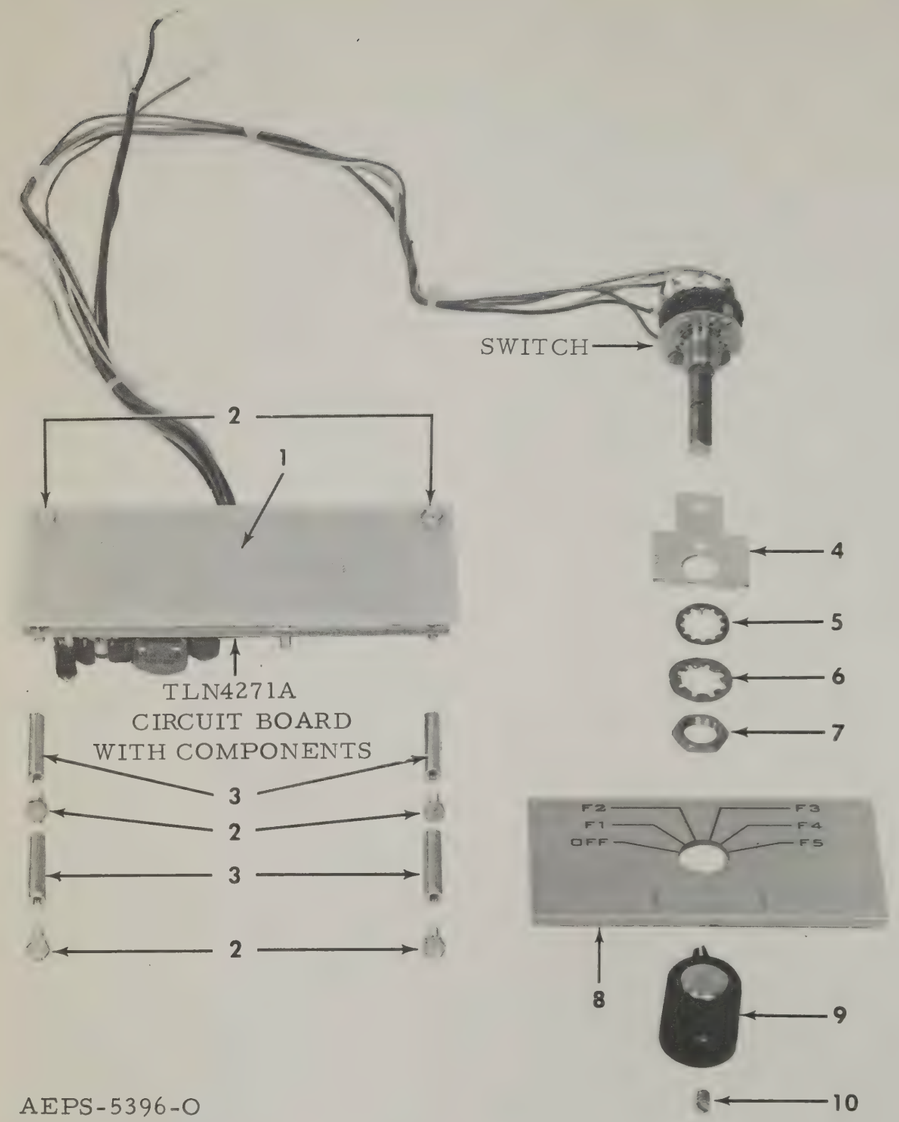
TLN1371A Single-Tone Encoder Board PL-1285-A

		CAPACITOR, fixed: uF ±10%; 50 V; unl. stated
C1	23K865594	68; 15 V
C2	23K865136	15 ±20%; 25 V
C3	8D82905G04	.068
C4	8D82905G04	.068
C5	8D84326A20	.0129
C6	21D82187B29	.001; 100 V
C7	8D82905G04	.068
C8	8D82905G04	.068
C9	8D82905G04	.068
C10	8D82905G25	.0033; 100 V
C11	8D82905G03	.047
C12	23D82783B08	1.0 ±20%; 35 V
		SEMICONDUCTOR DEVICE, diode:
CR1	48C82392B03	silicon
CR2	48C82392B03	silicon
CR3	48C82392B03	silicon
CR4	48C82392B03	silicon
		COIL, AF:
L1	24C84200A03	frequency determining; tapped
		TRANSISTOR:
Q1	48R869570	N-P-N; type M9570
Q2	48R869570	N-P-N; type M9570
Q3	48R869570	N-P-N; type M9570
Q4	48R869570	N-P-N; type M9570
Q5	48R869570	N-P-N; type M9570
		RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R1	6S129668	10k ±5%
R2	6S129982	5.6k ±5%
R3	6S129669	4.7k ±5%
R4	6S129887	12k ±5%
R5	6S129225	10k
R6	6S128685	22k
R7	6S129433	5.6k
R8	6S127806	27k
R9	6S129144	68k
R10	6S127802	1k
R11	6S128860	56
R12	6S127801	470
R13	6S127801	470
R14	6S127801	470
R15	6S127801	470
R16	6S129226	100k
R17	6S128687	6.8k
R18	6S5621	10; 1/2 W
R19	6S128902	47k
R20	6S129144	68k
R21	6S129231	3.3k
R22	6S129226	100k
R23	6S128902	47k
R24	6S128902	47k
R25	6S128685	22k
R26	6S128902	47k
R27	6S128685	22k
R28	6S127801	470
R29	6S128902	47k
R30	6S128902	47k
R31	6S128685	22k
R32	6S127801	470
R33	6S128689	2.2k
R34	6S129754	33
R35	6S129226	100k
		SWITCH:
S1	40C84354B01	rotary
NON-REFERENCED ITEM		
	TLN4271A	CIRCUIT BOARD ASSY (includes electrical components)

PARTS LIST

TLN1371A Single-Tone Multi-Frequency Kit
MECHANICAL PARTS PL-1278-O

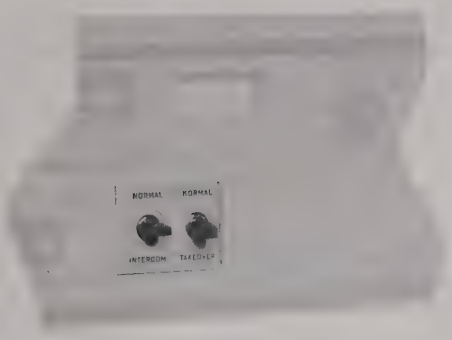
CODE	MOTOROLA PART NO.	DESCRIPTION
1	14B84263C01	INSULATOR, circuit board
2	3S125790	SCREW, machine; 4-40 x 5/16" plain hex head (ext. lockw.) 8 required
3	43A84115C03	STUD, circuit board mounting
4	7B83728G01	BRACKET, switch mounting
5		WASHER, switch stop setting (supplied with switch)
6		LOCKWASHER (supplied with switch)
7		NUT, mounting (supplied with switch)
8	64D83071G14	ESCUTCHEON
9	36B82630H01	KNOB, control; includes Item 10
10	3S7104	SETSCREW; 8-32 x 5/16" headless; slotted drive (supplied with Item 9)
NON-REFERENCED ITEM		
	37C82603D60	SLEEVE, heat-shrinkable; 10 required



AEPS-5396-O

MONITOR-INTERCOM

MODEL TLN1370A



AEPS-4434-O

1. DESCRIPTION

This kit provides intercom and supervisory control facilities for operators of local control solid-state consolette base stations that are used with parallel connected desk sets. The operator at the base station has provisions to monitor all transmissions originated by the desk sets and has a supervisory facility to prevent operation of the base station from desk sets. The unit permits communications between the desk set operators and the base station operator without actuating the transmitter. It also provides monitoring of all transmitted and received messages by all local operators. A "squelch priority" feature disables the intercom circuit whenever an on-frequency rf signal is received at the base station. (Refer to the functional block diagram.)

2. FCC REQUIREMENTS

With respect to the Industrial Services, each transmitter must be installed and protected in a manner to prevent access to or operation of the station by persons other than those duly authorized by the licensee. Each station must have a control point and may, with authorization of the Federal Communications Commission, have further control points. A control point is an operating position which meets certain conditions: It must be under the control and supervision of the licensee; it must have either a carrier operated device to provide continuous visual indications when the transmitter is radiating or a pilot lamp or meter which will provide continuous visual indication when the transmitter control circuits have been placed in a condition to produce radiation; and it

MOTOROLA INC. Communications Division
ENGINEERING PUBLICATIONS 1301 E. ALGONQUIN ROAD SCHAUMBURG, ILLINOIS 60172

must have facilities which will permit the person responsible for the operation of the transmitter to turn the transmitter carrier on and off at will.

A dispatch point is defined as any position from which messages may be transmitted under the supervision of the person at a control point who is responsible for the operation of the transmitter. Dispatch points may be installed without authorization from the commission. If dispatch points are installed in the system, the control point must be equipped to permit the person responsible for the operation of the transmitter to monitor all transmissions originating at dispatch points under his supervision. The control point must also have facilities which will permit the person responsible for the operation of the transmitter either to disconnect the dispatch point circuits from the transmitter or to render the transmitter inoperative by any dispatch point under his supervision.

The monitor-intercom kit allows the use of the base radio as a control point meeting all FCC requirements when local control units are used as dispatch points. Without this kit, each piece of local control equipment which is not within sight of the base station must be licensed as a control point.

3. FUNCTIONAL CIRCUIT DESCRIPTION

a. Intercommunication from Local Control Unit to Station

Audio from the handset mouthpiece is applied to audio switch Q3 (field effect transistor). Q3 is turned on as long as the receiver is squelched and no rf signal is received at the station or the transmitter is not keyed by the local microphone. The audio from the desk set is amplified by the receiver audio stages and appears at the speaker of the base station and all local control units.

b. Receiver Priority

When an rf signal is received at the station, a dc signal from the receiver squelch circuit is applied through emitter follower Q9 to the Schmitt trigger. Q8 of the Schmitt trigger starts to conduct. This turns on master switch Q6. Inverter Q4 conducts and turns off audio switch Q3. The intercom is now switched off and the received audio signal will be heard. At the end of the received signal, the audio switch again turns on .

c. Desk Set and/or Wallmount Transmit

When the NORMAL-TAKEOVER switch is in the NORMAL position, the push-to-talk switch on the handset provides the keying function through contact of the switch to turn on the transmitter. The push-to-talk switch of a desk set turns off Q8 of the Schmitt trigger if it is in the on condition. This turns on audio switch Q3 through operation of master switch Q6 and inverter Q4, enabling the base station operator to monitor desk set audio.

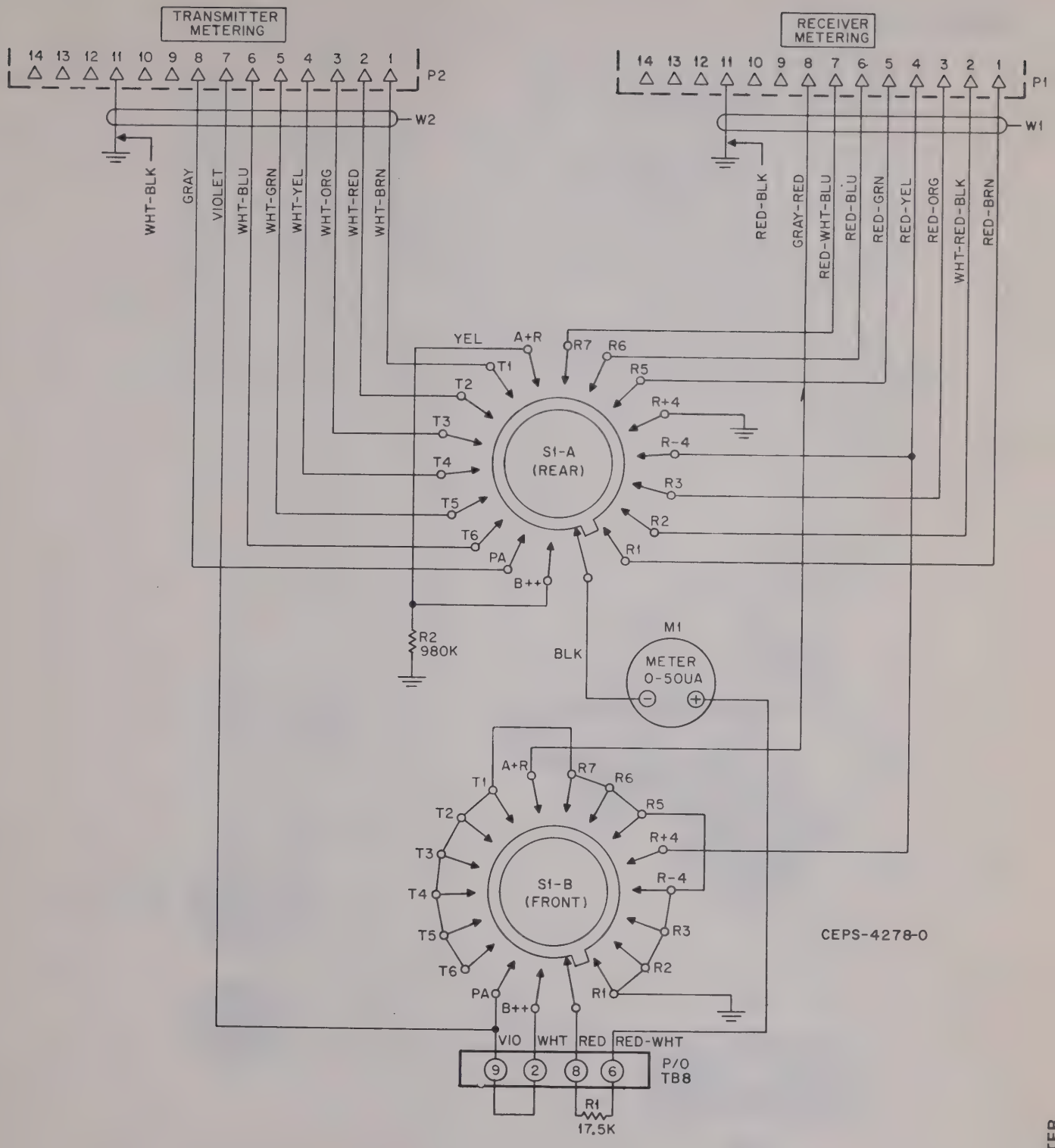
d. Supervisory Control

The base station operator can prevent desk set transmissions by placing the NORMAL-TAKEOVER switch in the TAKEOVER position. This disables the push-to-talk function of the local control units to the transmitter but allows an intercom audio path.

e. Base Station Transmit

The push-to-talk switch of the base station microphone turns off Q8 of the Schmitt trigger if it is in the on condition. This turns on audio switch Q3 through operation of master switch Q6 and inverter Q4. Audio from the base station microphone is applied to the exciter audio input of the transmitter and also to the base station receiver audio stages (when audio switch Q3 is on), enabling the desk sets to monitor the base station transmissions. A normally closed switch in the microphone paddle opens the speaker lead in the base station to disable the speaker and prevent acoustical feedback when the microphone push-to-talk switch is activated.

Since the receiver audio output stages are used as the intercom amplifier, and switched A+ bias voltage is removed from the audio driver stage during transmit conditions, a special bias circuit on the intercom kit circuit board provides operating bias for the receiver audio driver transistors during intercom use. This bias circuit consists of transistor Q5 which is at cutoff when master switch Q6 is off . A+ voltage is applied through R20, R19, CR2 and R18 to the audio driver transistors of the receiver via the shielded intercom audio output lead to bias them on. When an rf signal is received by the base station, a dc signal from the receiver squelch circuit is applied through emitter follower Q9 to the Schmitt trigger, turning on Q8. This turns "on" master switch Q6 and transistor Q5 so that the A+ voltage passes through R20 and



DC METER

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

DC Meter
Schematic Diagram
Motorola No. 63P81010E44-A
2/7/73-UP

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

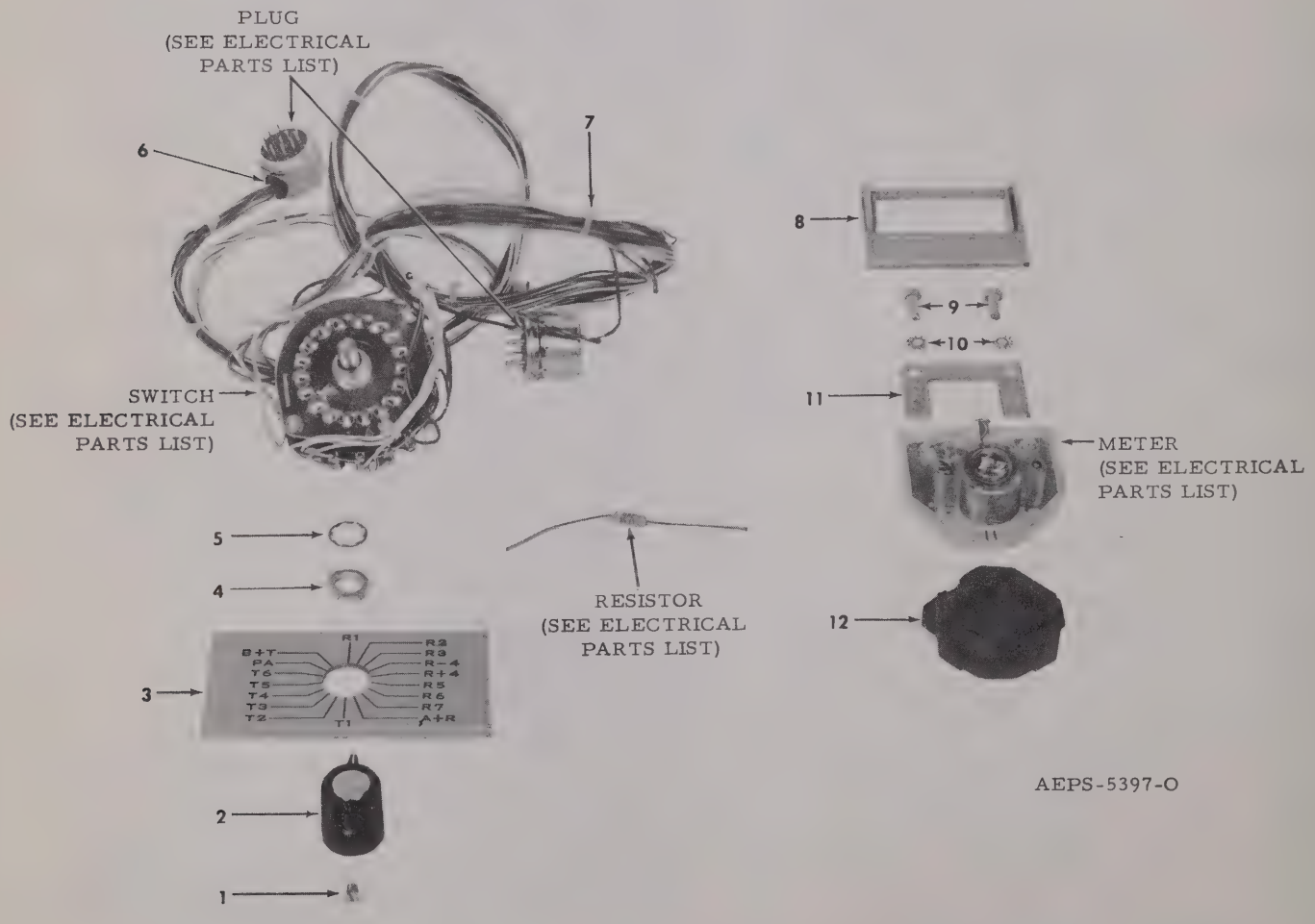
TLN4420A DC Metering Kit PL-1283-O

		AMMETER, DC;
M1	72C83319G01	0-50 microamperes; internal res. 2560 ohms ±10%
		CONNECTOR, plug;
P1	28B864669	male; 12 cont; does not incl. 15A82798H01 SHELL
P2	28B864669	male; 12 cont; does not incl. 15A82798H01 SHELL
		RESISTOR, fixed: 1/2 W;
R1	6K855337	17.5k ±2%
R2	6K811974	980k ±2%
		SWITCH, rotary:
S1	40C83106B01	2 section; each section single pole; 18 position; non-shorting
		CABLE ASSEMBLY, special purpose;
W1	1V80775A50	c/o misc. leads, laced
W2	1V80775A50	c/o misc. leads, laced

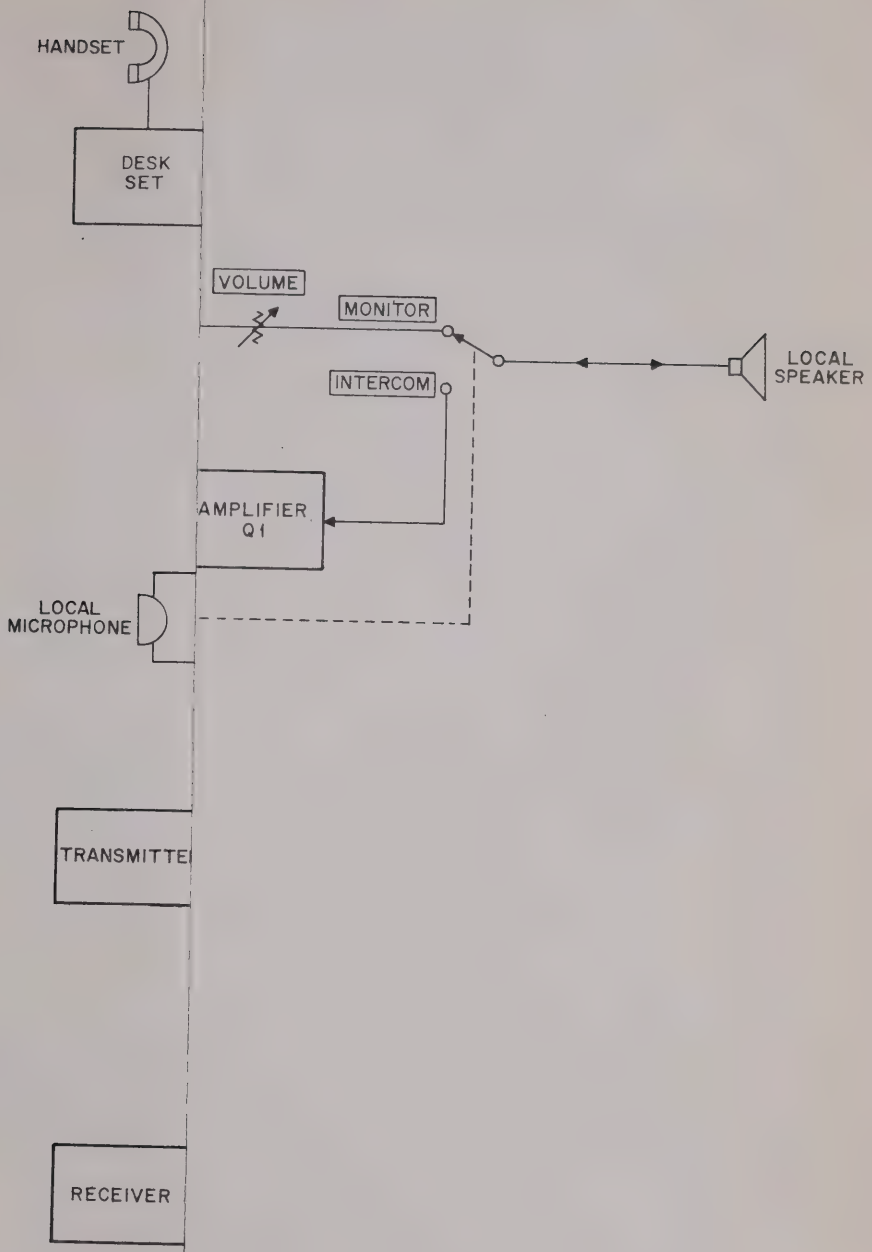
PARTS LIST

TLN4420A DC Metering Kit
MECHANICAL PARTS PL-1281-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	3S7104	SETSCREW: 8-32 x 3/16" headless; slotted drive (supplied with Item 2)
2	36B82630H01	KNOB, control; includes Item 1
3	64D83071G10	PANEL INSERT, switch mounting; includes legend
4	2S1376	NUT, machine; 3/8-32 x 1/2" hex
5	4S7691	LOCKWASHER; 3/8" internal type
6	37K10599	GROMMET, rubber
7	42S10217A02	STRAP, cable harness
8	64C83073G02	PANEL INSERT, meter mounting
9	3S3375	SCREW, tapping; 6-20 x 5/16" plain hex head
10	4S7666	LOCKWASHER: No. 6 external type
11	42B83155G01	CLIP, meter mounting
12	26C83747G01	COVER, meter



AEPS-5397-O


HANDSET
DESK SET
VOLUME
MONITOR
LOCAL SPEAKER
INTERCOM
AMPLIFIER Q1
LOCAL MICROPHONE
TRANSMITTE
RECEIVER

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

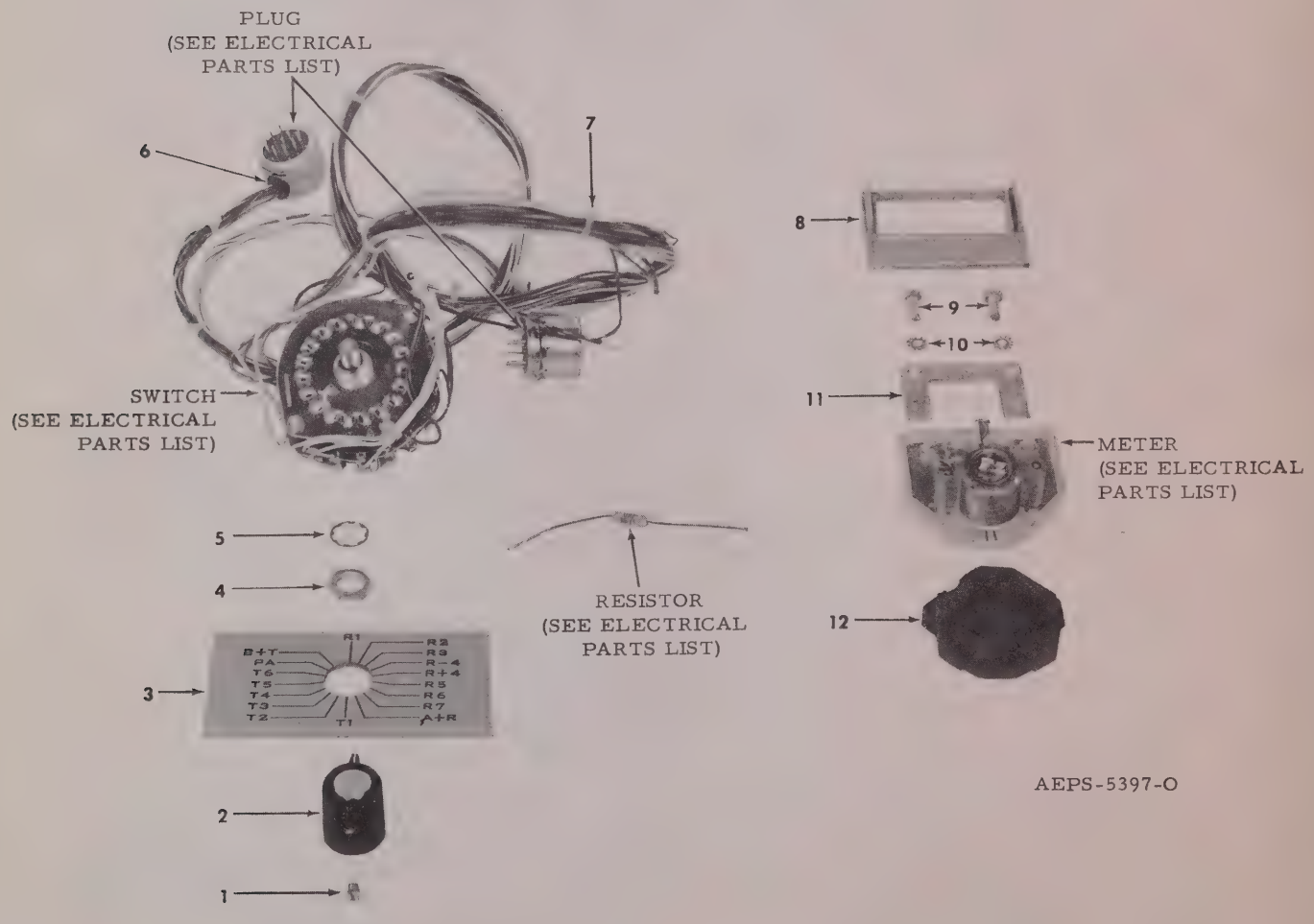
TLN4420A DC Metering Kit PL-1283-O

		AMMETER, DC;
M1	72C83319G01	0-50 microamperes; internal res. 2560 ohms ±10%
		CONNECTOR, plug;
P1	28B864669	male; 12 cont; does not incl. 15A82798H01 SHELL
P2	28B864669	male; 12 cont; does not incl. 15A82798H01 SHELL
		RESISTOR, fixed: 1/2 W;
R1	6K855337	17.5k ±2%
R2	6K811974	980k ±2%
		SWITCH, rotary:
S1	40C83106B01	2 section; each section single pole; 18 position; non-shorting
		CABLE ASSEMBLY, special purpose;
W1	1V80775A50	c/o misc. leads, laced
W2	1V80775A50	c/o misc. leads, laced

PARTS LIST

TLN4420A DC Metering Kit
MECHANICAL PARTS PL-1281-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	3S7104	SETSCREW: 8-32 x 3/16" headless; slotted drive (supplied with Item 2)
2	36B82630H01	KNOB, control; includes Item 1
3	64D83071G10	PANEL INSERT, switch mounting; includes legend
4	2S1376	NUT, machine; 3/8-32 x 1/2" hex
5	4S7691	LOCKWASHER; 3/8" internal type
6	37K10599	GROMMET, rubber
7	42S10217A02	STRAP, cable harness
8	64C83073G02	PANEL INSERT, meter mounting
9	3S3375	SCREW, tapping; 6-20 x 5/16" plain hex head
10	4S7666	LOCKWASHER: No. 6 external type
11	42B83155G01	CLIP, meter mounting
12	26C83747G01	COVER, meter



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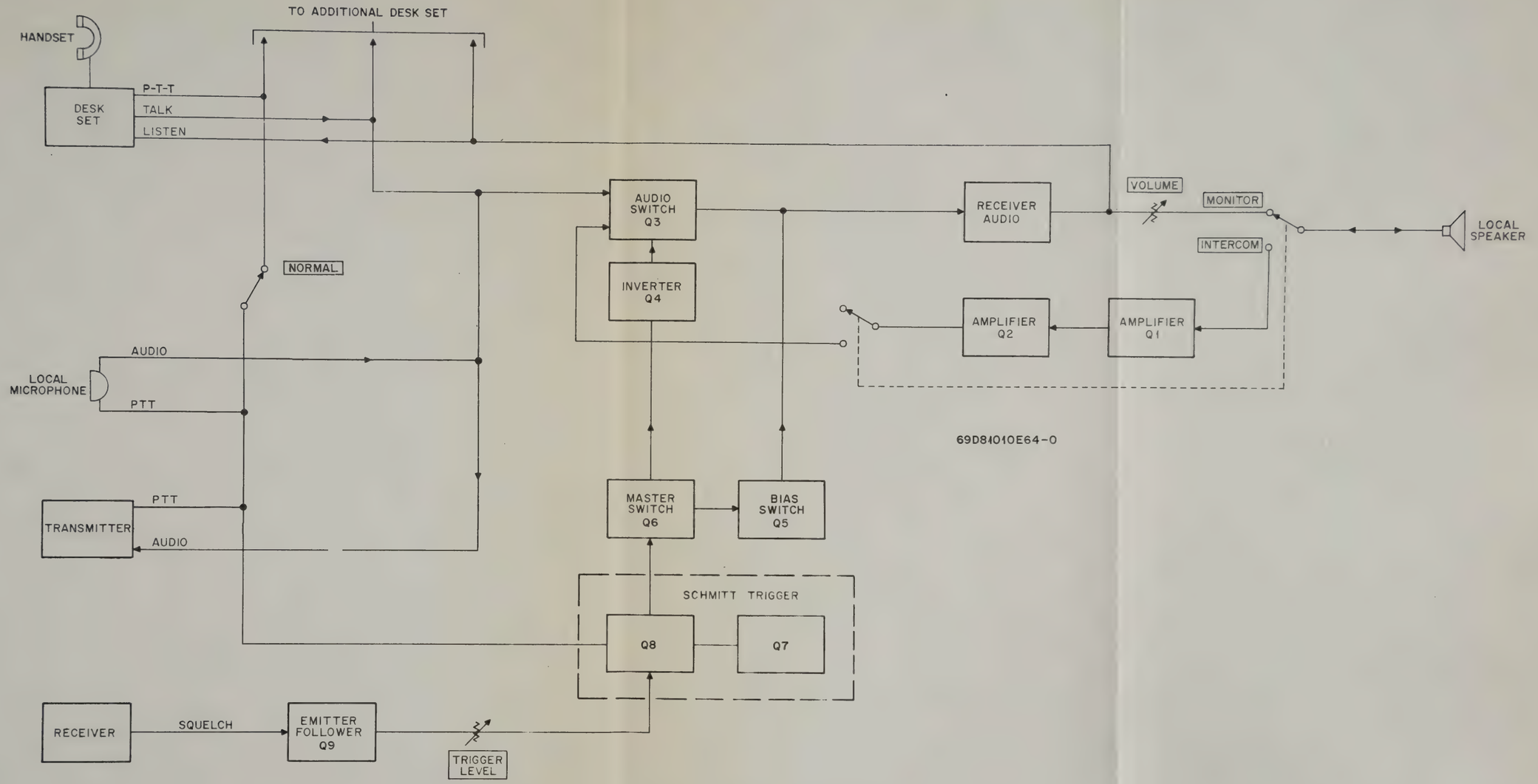
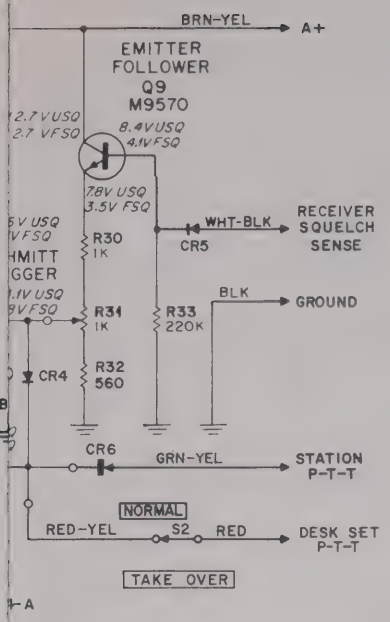
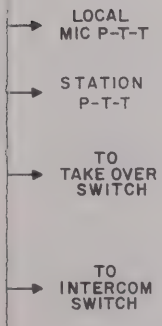

TO ADDITIONAL DESK SET
HANDSET
DESK SET
P-T-T
TALK
LISTEN
NORMAL
AUDIO SWITCH Q3
INVERTER Q4
RECEIVER AUDIO
VOLUME
MONITOR
INTERCOM
LOCAL SPEAKER
AMPLIFIER Q2
AMPLIFIER Q1
AUDIO
LOCAL MICROPHONE
PTT
69D84010E64-0
PTT
TRANSMITTER
AUDIO
MASTER SWITCH Q6
BIAS SWITCH Q5
SCHMITT TRIGGER
Q8
Q7
RECEIVER
SQUELCH
EMITTER FOLLOWER Q9
TRIGGER LEVEL

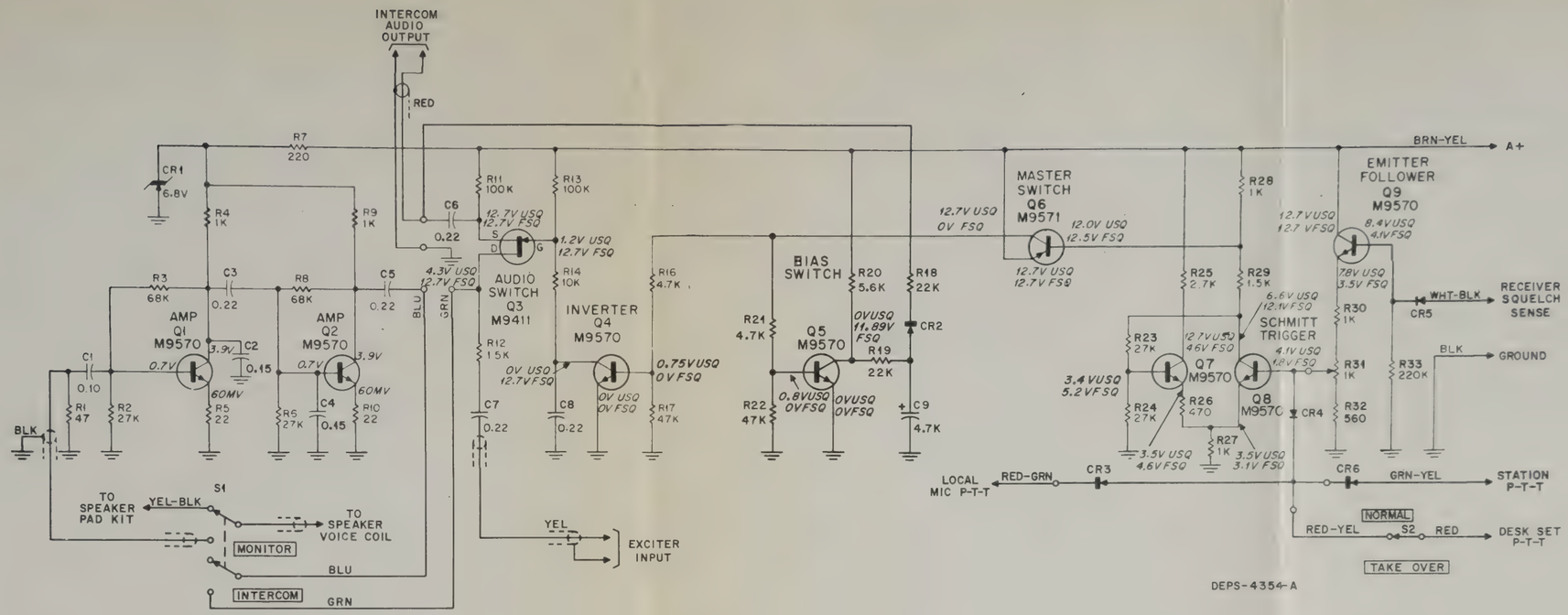




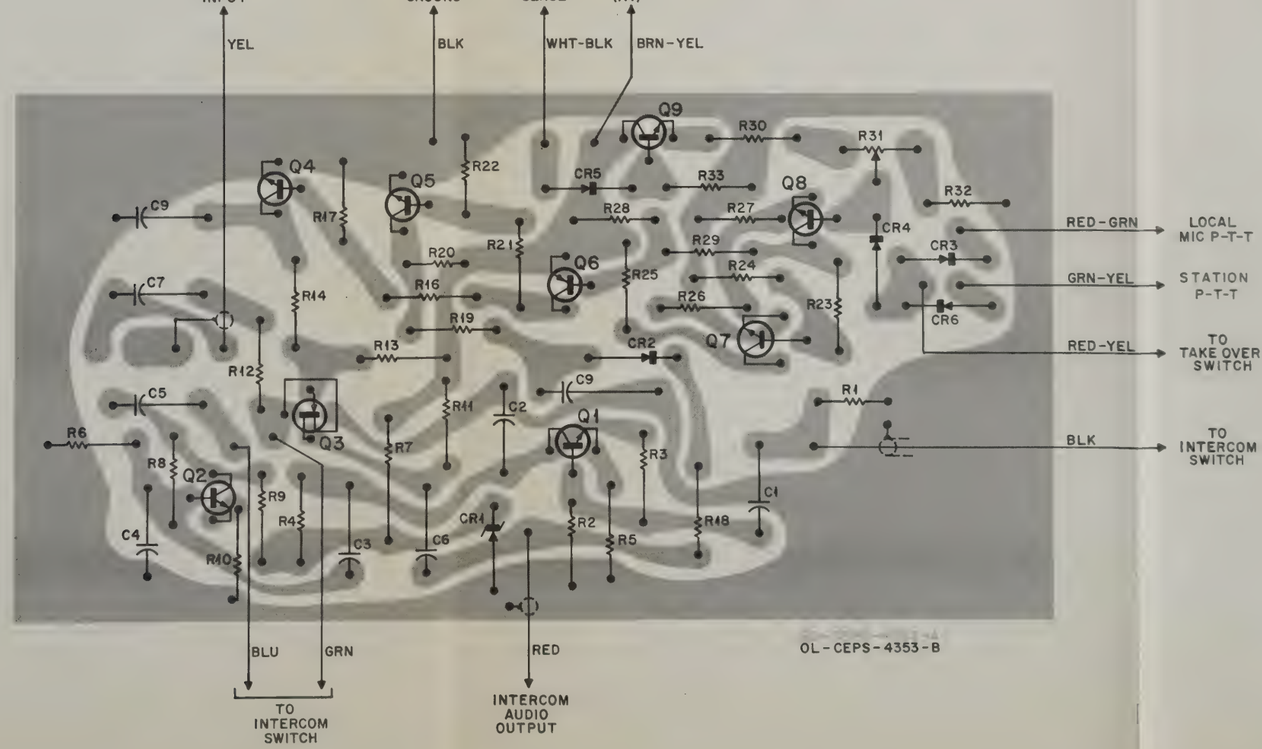
MONITOR-INTERCOM

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Monitor-Intercom Kit
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E43-B
2/7/73-UP



DEPS-4354-A



OL-CEPS-4353-B

PARTS LIST SHOWN ON
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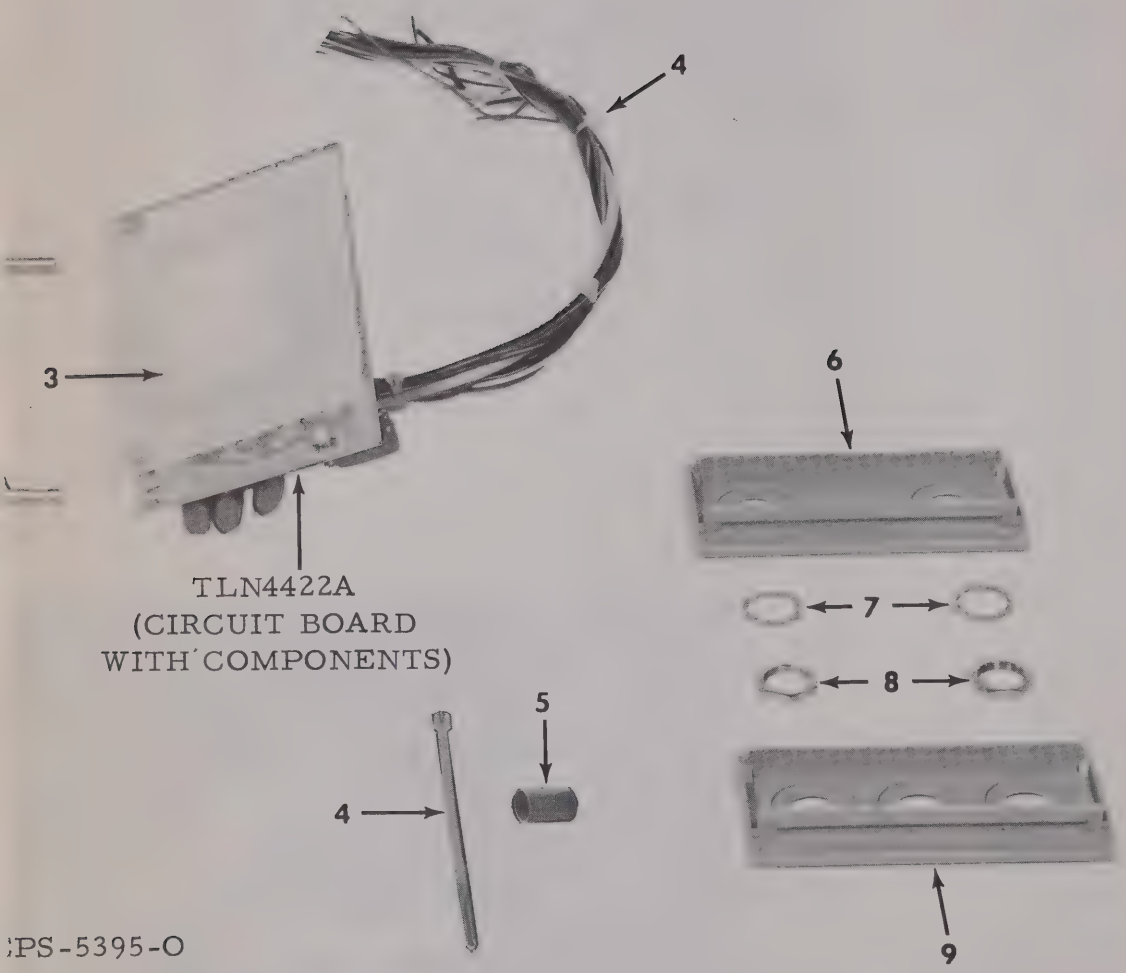
Monitor-Intercom Kit
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E43-B
2/7/73-UP



PS-5395-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

Monitor-Intercom Kit (p/o TLN1370A) PL-1284-A

		CAPACITOR, fixed: uF ±10%; 50 V; unl. stated
C1	8D82905G07	0.1
C2	8D82905G05	0.15
C3	8D82905G11	0.22
C4 thru 8	8D82905G11	0.22
C9	23K865137	4.7 ±20%; 25 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48D82256C37	Zener type; 6.8 V
CR2 thru 6	48C82392B03	silicon; RD1343
		TRANSISTOR: (SEE NOTE)
Q1	48R869570	N-P-N; M9570
Q2	48R869570	N-P-N; M9570
Q3	48R869411	P-N-P; field-effect; M9411
Q4	48R869570	N-P-N; M9570
Q5	48R869570	N-P-N; M9570
Q6	48R869571	P-N-P; M9571
Q7	48R869570	N-P-N; M9570
Q8	48R869570	N-P-N; M9570
Q9	48R869570	N-P-N; M9570
		RESISTOR, fixed: ±10%; 1/4 W unl. stated
R1	6S129233	47
R2	6S127806	27k
R3	6S129144	68k
R4	6S127802	1k
R5	6S131641	22
R6	6S127806	27k
R7	6S6270	220; 1/2 W
R8	6S129144	68k
R9	6S127802	1k
R10	6S131641	22
R11	6S129226	100k
R12	6S127803	1.5k
R13	6S129226	100k
R14	6S129225	10k
R15		NOT USED
R16	6S127804	4.7k
R17	6S128902	47k
R18	6S128685	22k
R19	6S128685	22k
R20	6S129433	5.6k
R21	6S127804	4.7k
R22	6S128902	47k
R23	6S129147	220k
R24	6S127806	27k
R25	6S129707	2.7k ±5%
R26	6S129709	470 ±5%
R27	6S129805	1k ±5%
R28	6S129805	1k ±5%
R29	6S129681	1.5k ±5%
R30	6S127802	1k
R31	6S127802	1k
R32	6S129620	560
R33	6S129147	220k
		SWITCH, lever;
S1	40D83303G04	2 form "C"
S2	40D83303G02	1 form "B"

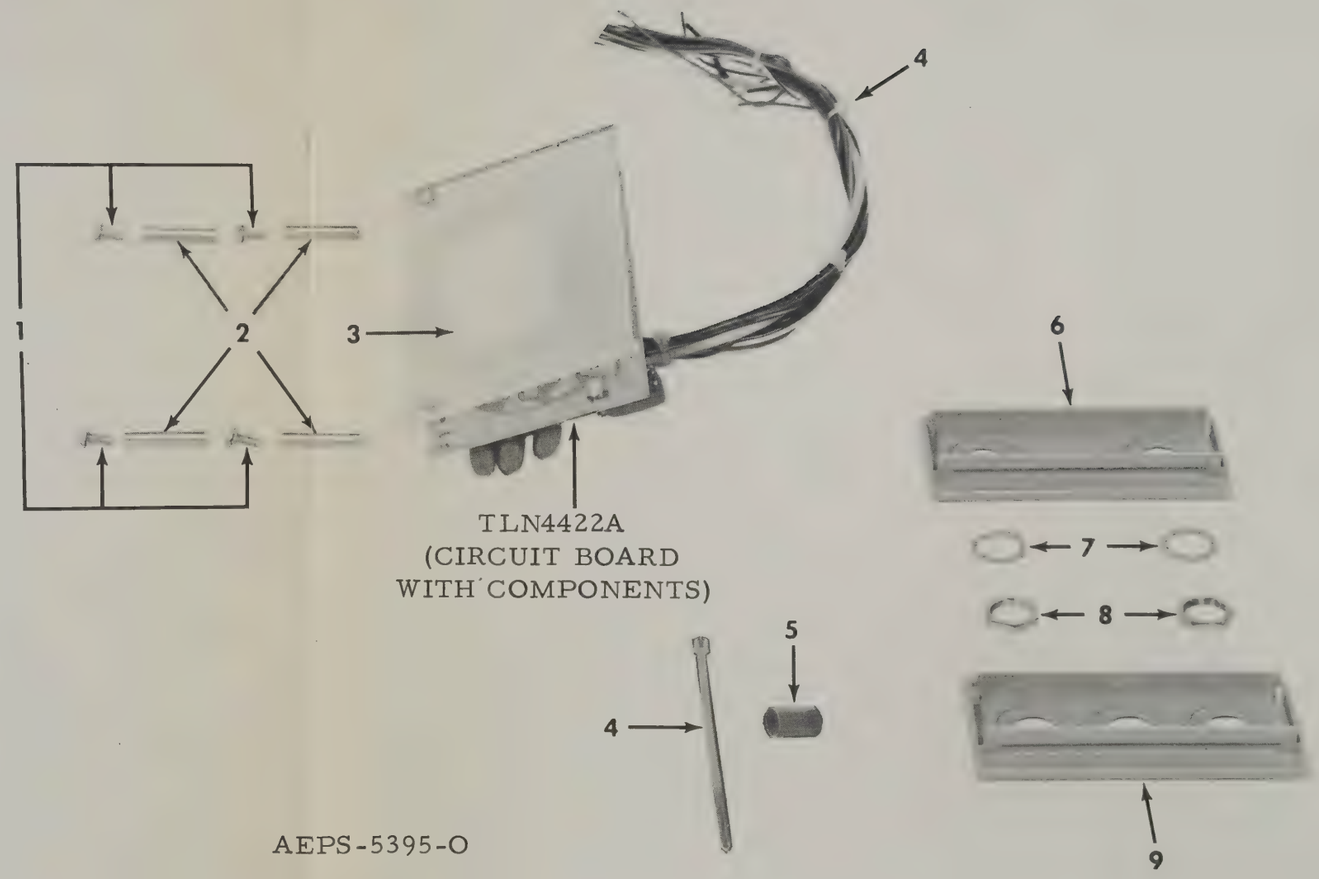
NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

PARTS LIST

TLN1370A Intercom Kit
MECHANICAL PARTS PL-1277-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	3S125790	SCREW, machine; 4-40 x 5/16" plain hex head (ext. lockw.)
2	43A84115C03	STUD, circuit board mounting
3	14B84265C01	INSULATOR, circuit board
4	42A10217A02	STRAP, cable harness
5	37S132049	TUBING, plastic; No. 8 clear; 1" length required
6	64D83071G13	ESCUTCHEON (non-"PL")
7	4S8424	LOCKWASHER: 15/32" internal type
8	2S8382	NUT, machine; 15/32-32 x 9/16" hex
9	64D83071G12	ESCUTCHEON ("PL")



TLN4422A
(CIRCUIT BOARD
WITH COMPONENTS)

AEPS-5395-O

PAGING CONVERSION KIT

MODEL TLN1373A

1. INTRODUCTION

Whenever a paging encoder is used in conjunction with a PL base station, a paging conversion kit is required. The purpose of this kit is to inhibit the transmitter PL tone during paging tone transmissions.

2. DESCRIPTION

When a paging signal is initiated by pressing the PAGE pushbutton on the encoder, a relay is energized within the encoder. This relay will remain energized for the duration of the paging signal cycle. A set of contacts on this relay applies a chassis ground from the encoder to the coil of relay K1, in the conversion kit, energizing K1.

With K1 energized, the PL encoder output to the transmitter is opened, via contacts on the relay, and PL tone transmission is inhibited. Another set of contacts also applies a ground to the consolette station push-to-talk input eliminating the need to manually key the transmitter during paging tone transmissions.

When the TRANS pushbutton on the encoder is pressed, a chassis ground is applied to the coil of relay K1, in the conversion kit. The sequence of events for this action is the same as previously described once relay K1 is energized. This permits voice transmission to non-PL units. Voice transmission to PL units is made as usual using the desk microphone.

3. OPERATION

a. Connect power cord to ac outlet.

b. Turn on base station.

c. Turn the SQUELCH control fully counterclockwise and press the monitor switch on the microphone. This disables the tone-coded squelch circuit causing the speaker to emit a rushing noise if the channel is clear. Reset the SQUELCH control.

d. Press the selector button(s) and the PAGE button on the selective paging encoder. The indicator lamp will light and the transmitter will be keyed. The transmission will not be heard on a "Private-Line" tone-coded squelch receiver since the tone generator in the transmitter is disconnected. However, the pager coded to respond to the paging tones selected by the particular selector button(s) will be activated. Voice cannot be transmitted while the indicator lamp is on, as the microphone is disconnected. Press the TRANS button on the encoder immediately after the indicator lamp is turned on. Keep the transmit button pressed after the lamp turns off and talk into the microphone. The pager will alert and a voice message may be transmitted.

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REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN1373A Paging Conversion Kit PL-1288-O

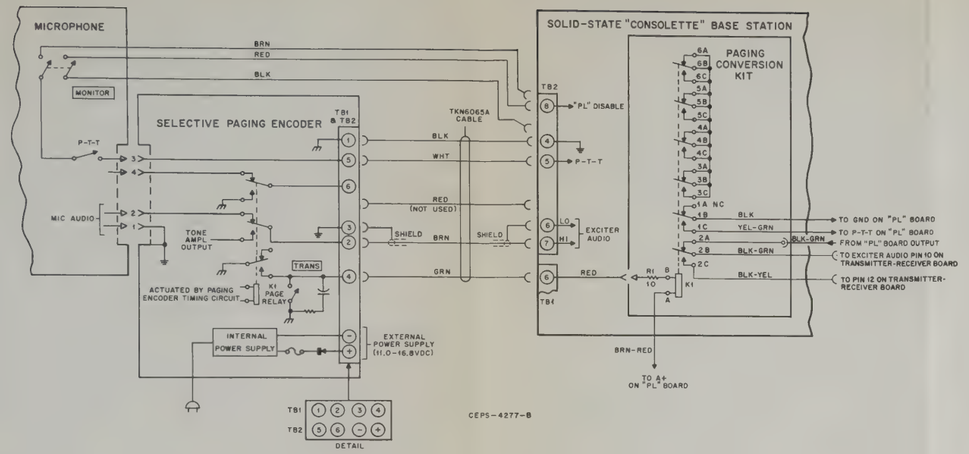
K1	80C83812G01	RELAY, armature; 12 V dc; 6 form "C" contact; coil res. 130 ohms
R1	6S5621	RESISTOR, fixed: 10 ±10%; 1/2 W

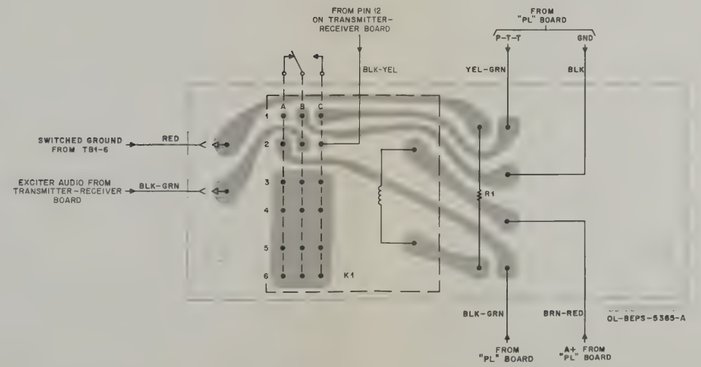
PARTS LIST

TLN1373A Paging Kit
MECHANICAL PARTS PL-1280-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	42S10217A03	STRAP, cable harness
2	3S134168	SCREW, tapping; 4-40 x 1/4" "Phillips" hex head (int. lockw.)
3	1V80713B65	BOARD, printed circuit (less components)
4	7A84107C01	BRACKET, circuit board mounting
5	3S134184	SCREW, machine; 6-32 x 5/8" "Phillips" hex head
6	14C83799G02	CONNECTOR BODY (female)
7	39C83797G01	TERMINAL, connector (male)
8	39C83798G01	TERMINAL, connector (female)
9	14C83799G01	CONNECTOR BODY (male)

Paging Conversion Kit
Schematic & Intercabling Diagram
& Circuit Board Detail
Motorola No. 63P81010E49-B.
2/7/73-UP

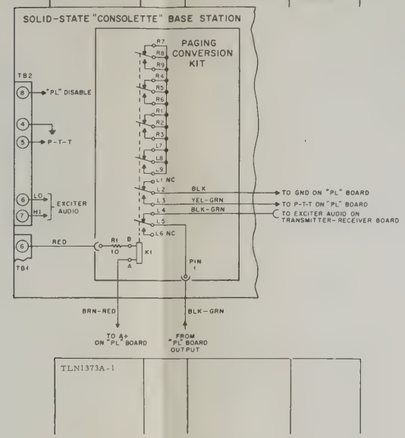


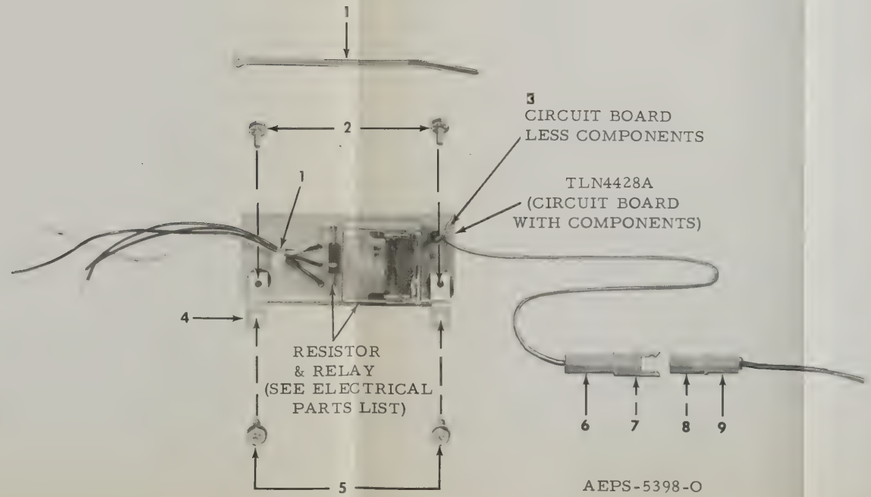


REVISIONS

63P81010E49-B

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1373A		WIRING CHANGES CIRCUIT WAS:	SHOWN BELOW





REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN1373A Paging Conversion Kit PL-1288-O

K1	80C83812G01	RELAY, armature; 12 V dc; 6 form "C" contact; coil res. 130 ohms
R1	6S5121	RESISTOR, fixed 10 ±10%; 1/2 W

PARTS LIST

TLN1373A Paging Kit
MECHANICAL PARTS PL-1280-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	42S10217A03	STRAP, cable harness
2	3S134168	SCREW, tapping; 4-40 x 1/4" "Phillips" hex head (int. lockw.)
3	1V80713B65	BOARD, printed circuit (less components
4	7A84107C01	BRACKET, circuit board mounting
5	3S134184	SCREW, machine; 6-32 x 5/8" "Phillips" hex head
6	14C83799G02	CONNECTOR BODY (female)
7	39C83797G01	TERMINAL, connector (male)
8	39C83798G01	TERMINAL, connector (female)
9	14C83799G01	CONNECTOR BODY (male)

Paging Conversion Kit
Schematic & Intercabling Diagram
& Circuit Board Detail
Motorola No. 63P81010E49-B,
2/7/73-UP

TIME-OUT TIMER

MODEL TABLE

MODEL	DESCRIPTION
TLN1097A	Time-Out Timer
TLN4323A	Time-Out Timer Adapter

1. DESCRIPTION

The time-out timer is used to automatically limit continuous transmission time to one minute. At the end of one minute, the timer automatically turns off the transmitter and generates an alert tone which is routed to the receiver audio stages and speaker. This tone gives the operator an audible indication of transmitter turn-off. Once the timer has timed out, it may be reset for another minute by simply unkeying, and then keying the transmitter.

The timer is a plug-in module which plugs directly into the transmitter receiver unit at receptacle J250. This receptacle, transistor Q250, and resistor R250 are mounted on the transmitter-receiver only in radios manufactured with the time-out timer option.

2. OPERATION

When the station is in the receive condition, keyed A+ is removed, therefore, diode CR251 is reverse biased and transistor Q251 is saturated by the bias applied to its base via resistors R253 and R254. When the transmitter is keyed, the keyed A+ forward biases diode CR251 and reverse biases the base emitter junction of Q251, turning it off. With Q251 cut-off, capacitor C251 starts to discharge through resistor R255. During this discharge time the emitter of transistor Q252 is held at approximately 2.7 volts by the combination of resistors R256 and R257. This emitter voltage holds Q252 at cutoff. After a one minute period, the voltage across capacitor C251 drops to approximately 1.6 volts. At this time, diode CR252 becomes forward biased turning on transistor Q252 which supplies sufficient gate current to fire the silicon controlled rectifier (SCR) SCR251. When the SCR conducts, the base-collector junction of transistor Q253, which serves as a diode, becomes forward biased causing transistor Q250 to shut off. On radio sets equipped with a time-out timer, Q250, normally acts as an emitter follower and is the A+ voltage source for the transmitter oscillator-modulator. Thus, when Q250 is shut off, the transmitter is shut off.

When the transmit-receive relay opens, transmitter keyed A+ drops to zero thereby permitting SCR251 to reset.

When the SCR conducts, the unijunction transistor (Q255) oscillates at an audio frequency. The output from oscillator Q255 is fed through capacitor C255 and R252 to the audio drivers in the receiver as the alert tone. The amplitude of the alert tone may be changed by changing the value of R252 (at no time should R252 be less than 47K ohms). The table on the schematic diagram shows the amplitude variations in speaker output, for different selected values of R252. Biasing voltages for these stages are supplied via resistor R251 and diode CR253 when the keyed A+ is applied.

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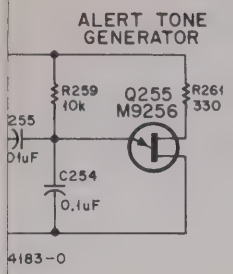


NOTES:

1. VOLTAGE READING CONDITIONS, [ ] = TRANSMITTER KEYED READING
   ( ) = TIMED-OUT READING
2. TIME-OUT TIMER AND CONNECTIONS ARE OPTIONAL. Q250, R252, AND J250 ARE NOT SUPPLIED UNLESS UNIT IS FACTORY EQUIPPED WITH TIME-OUT TIMER.
3. A COMPONENT IS OMITTED FROM TRANSMITTER-RECEIVER IN UNITS EQUIPPED WITH TIME-OUT TIMER: 25-50 MHz MODELS -- R141
   136-174 MHz MODELS -- CR104
4. DECREASE VALUE OF R252 TO INCREASE VOLUME OF OUTPUT ALERT TONE.

R252 VALUE	SPEAKER OUTPUT VARIATIONS IN dB
47K	+10.1
56K	+ 8.4
68K	+ 7.2
120K	+ 2.8
180K	Reference (100 mV)
270K	- 2.8
330K	- 6
470K	- 9.8
680K	-13.8

TIME-OUT TIMER MODEL TABLE

TLN1097A T-O-T		TLN4323A T-O-T ADAPTER KIT
TLN8403A T-O-T BOARD	TLN8404 COMPONENTS KIT	

EPS-4441-O

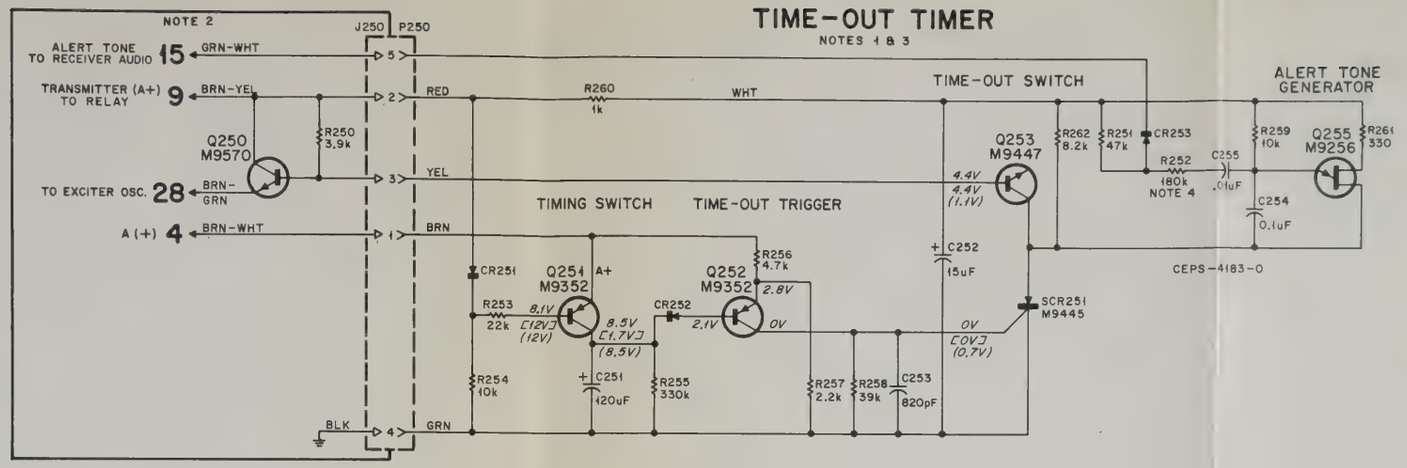
TIME-OUT TIMER

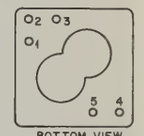
PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Time-Out Timer &
Adapter Kit
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E69-O
2/7/73-UP

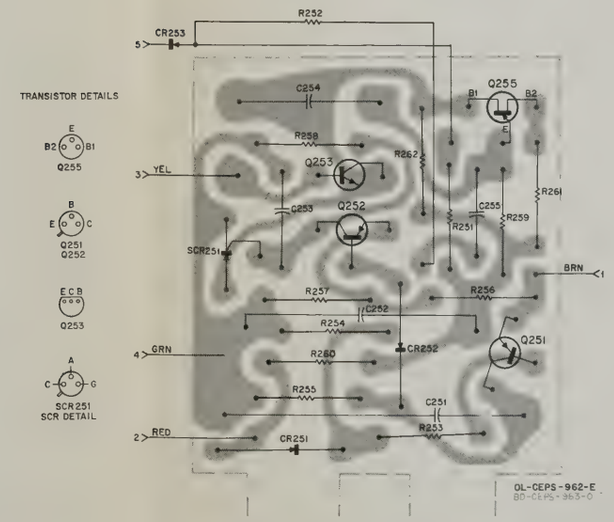
TIME-OUT TIMER

NOTES 1 & 3





BOTTOM VIEW
TIME-OUT TIMER UNIT



NOTES:

1. VOLTAGE READING CONDITIONS, [ ] = TRANSMITTER KEYED READING
   ( ) = TIMED-OUT READING
2. TIME-OUT TIMER AND CONNECTIONS ARE OPTIONAL. Q250, R252, AND J250 ARE NOT SUPPLIED UNLESS UNIT IS FACTORY EQUIPPED WITH TIME-OUT TIMER.
3. A COMPONENT IS OMITTED FROM TRANSMITTER-RECEIVER IN UNITS EQUIPPED WITH TIME-OUT TIMER: 25-50 MHz MODELS -- R141
   136-174 MHz MODELS -- CR104
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R252 VALUE	SPEAKER OUTPUT VARIATIONS IN dB
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330K	- 6
470K	- 9.8
680K	-13.8

TIME-OUT TIMER MODEL TABLE

TLN1097A T-O-T		
TLN8403A T-O-T BOARD	TLN8404 COMPONENTS KIT	TLN4323A T-O-T ADAPTER KIT

EPS-4441-O

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Time-Out Timer &
Adapter Kit
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E69-O
2/7/73-UP

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

TLN1097A Time-Out Timer — PL-1118-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF ±10%; unl. stated
C251	23D83185D01	120; 15 V
C252	23D83214C02	15 ±20%; 25 V
C253	21C82187B17	820 pF; 500 V
C254	8D83293B01	0.1; 50 V
C255	21D82428B59	.01 ±20%; 200 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR251	48C82392B03	silicon
CR252	48C82392B09	silicon
CR253	48C82392B03	silicon
		TRANSISTOR: (SEE NOTE)
Q251	48R869352	P-N-P; type M9352
Q252	48R869352	P-N-P; type M9352
Q253	48R869447	N-P-N; type M9447
Q255	48R869256	unijunction; type M9256
		RESISTOR, fixed: ±10%; 1/4 W; unl. stated
R251	6S128902	47K
R252	6S129229	180K
R253	6S128685	22K
R254	6S129225	10K
R255	6S129473	330K ±5%
R256	6S129669	4.7K ±5%
R257	6K129804	2.2K ±5%
R258	6K128903	39K
R259	6S129225	10K
R260	6S127802	1K
R261	6S129775	330
R262	6S128686	8.2K
		RECTIFIER, control:
SCR251	58R869445	type M9445
NON-REFERENCED ITEMS		
	1V80763A66	SOCKET ASSY. timer board
	TLN8403A	CIRCUIT BOARD ASSEMBLY: does not include CR253, R252

TLN4323A Installation Kit — PL-1021-O

		TRANSISTOR: (SEE NOTE)
Q250	48R869570	N-P-N; type M9570
		RESISTOR, fixed:
R250	6S129232	3.9k ±10%; 1/4 W
NON-REFERENCED ITEMS		
	1V80708B80	CIRCUIT BOARD ASSY.
	41A82114E01	SPRING, crystal hold-down
	3S134184	SCREW, tapping: No. 4-40 x 5/16"

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

"CHANNEL-SCAN" MONITOR

MODEL TLN1372A

1. DESCRIPTION

This "Channel-Scan" monitor is an optional accessory for multi-frequency solid-state Consolette base stations. It allows the operator to monitor up to four channels with a single receiver. The unit provides sequential scanning of the receiver's frequencies, activating each receiver channel element in turn. When a signal is received, the unit stops scanning and the message is heard. However, if it stops on a non-priority channel, the unit continues to sample the priority channel. If a signal is received on the priority channel, the receiver switches to the priority channel, as long as the carrier is received. This assures that the operator can monitor any of the channels which the station is capable of receiving without missing any messages on the priority channel. If desired, the priority channel audio can be boosted approximately 3 to 5 dB above a non-priority channel by jumper changes. (Earlier units were all equipped with the audio boost feature.)

2. OPERATING INSTRUCTIONS

On stations equipped with "Channel-Scan" monitor, the frequency selector switch is a dual, concentric control device. The front control selects the receiver priority channel -- F1, F2, F3 or F4. The rear control selects the transmitter frequency -- F1, F2, F3, or F4. All channels are monitored when the SCAN ON-SCAN OFF switch is in the SCAN ON position.

Select the channel which is to have priority with the front F1-F2-F3-F4 control. Set the SQUELCH control at threshold for most sensitive operation. Since the audio is muted while scanning, disable scan operation while adjusting squelch as follows:

(1) SCAN ON-SCAN OFF switch to SCAN OFF.

(2) "PL" ON-OFF to OFF on PL stations.

(3) SQUELCH control counterclockwise until noise is heard.

(4) Adjust VOLUME as desired.

(5) Turn SQUELCH control clockwise slowly to point where noise just quiets.

(6) Turn SCAN ON-SCAN OFF switch to SCAN ON and PL switch ON to return to scan operation.

When a signal is received on the priority channel, the PRIORITY lamp will light. Signals received on non-priority channels do not cause the PRIORITY lamp to light. In units jumpered for audio boost operation, non-priority signals are heard at a lower volume than priority signals. When a signal is received, readjust the VOLUME control as desired. A signal on the priority channel will never be missed, the unit automatically reverts to the priority channel when a signal is present.

To monitor only one channel, place the SCAN ON-SCAN OFF switch in the SCAN OFF position and select the desired receive frequency with the front F1-F2-F3-F4 control. In the SCAN OFF position the PRIORITY light is always lit.

On "Private-Line" stations equipped with this "Channel-Scan" monitor, the operation is the same

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as described previously except that the signal will be heard only if it is coded with the proper PL tone, or the PL switch is OFF.

3. FUNCTIONAL OPERATION

a. General

Refer to the block diagram. Applying power to the unit starts slow speed clock multivibrator Q11 and Q12. The slow speed clock output starts the high speed clock through AND gate CR7 to Q4. The high speed clock includes multivibrator Q4 and Q6, and monostables Q5 and Q7, which are connected in a feedback loop through inhibit diodes CR3 and CR4. With no received carrier signal, the high speed clock changes state each 6 milliseconds. This square wave switching signal is coupled through clock driver Q8 to the 3-input NAND gates Q107, Q110, Q113, and Q116 and to the second clock multivibrators Q101, Q102, Q103 and Q104. The output of Q8 is also applied to priority select switch Q106. During the positive portion of each pulse, the priority select switch Q106 is activated and overrides the NAND gates, thus forcing the priority channel to be selected. During the negative portion of each pulse, Q106 is cut off and the second clock multivibrators and NAND gates operate as a count-down circuit to sequentially select each channel. The resultant scanning action follows this scanning sequence--priority channel - F1 - priority - F2 - priority - F3 - priority - F4.

During scan, the output of high speed clock monostables Q5 and Q7 activate audio mute switch Q14 which mutes the receiver audio output during scan. Squelch buffer amplifier Q201 and Q202 also mute the receiver during scan operation by grounding the PL disable point in the receiver audio circuit. During scan, lamp blankers Q9 and Q10 inhibit priority lamp driver Q1 to keep the light extinguished.

An input from the receiver SQUELCH control is applied to squelch circuit Q16 through Q21. When no carrier signal is received, the noise input results in +4 volts dc voltage output from the squelch circuit. When the unit scans a frequency with a signal present, there is no (or very little) noise input and the squelch circuit produces A+ (+12 V) dc voltage output. The setting of the SQUELCH control adjusts the sensitivity of the "Channel-Scan" monitor as well as the receiver. The unit will not stop scanning and lock-on to a carrier unless the carrier exceeds the squelch threshold level of the "Channel-Scan" monitor.

When a priority channel signal is received, the dc output of squelch circuit Q21 stops the high speed clock through CR3 and CR4 (the feedback path is interrupted). The scanning action stops and the message on that channel is heard. A number of simultaneous steps are required to accomplish this action. as follows:

Since the output of Q6 is always low during the priority channel scan periods, it is low when scanning stops in the priority channel. This voltage cuts off priority clock inhibit switch Q13 which back biases CR7 to block the output of the slow speed clock.

- Audio mute switch Q14 unmutes the receiver audio.

- The squelch output inhibits scanning through AND gate inhibit CR101.

- Lamp blanker Q9 and Q10 are deactivated which allows Q1 to operate and turn on the PRIORITY lamp.

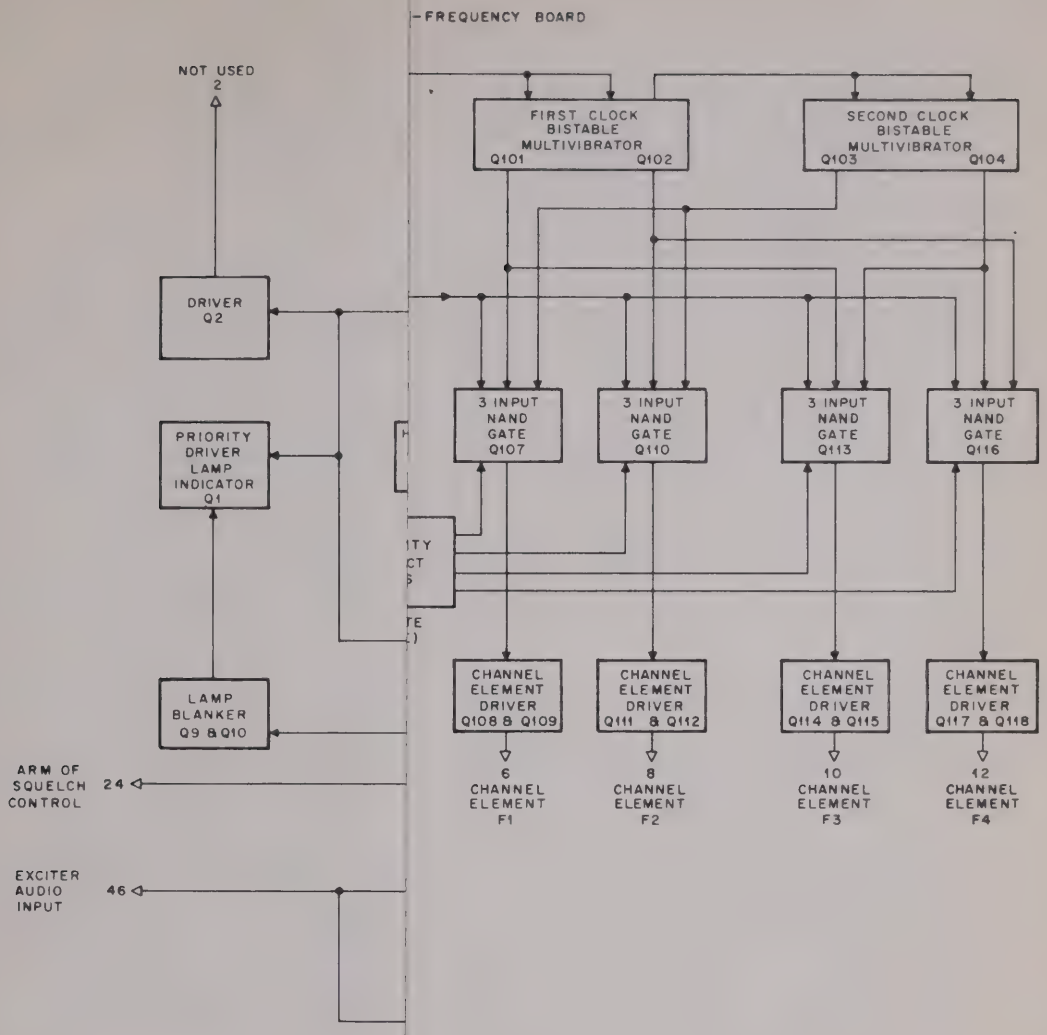
- As shipped from the factory, all present units are wired so that priority and non-priority channel audio is heard at the same level. In all early units, and in present units jumpered for audio boost operation, priority channel audio is boosted. The low from Q6 cuts off Q15 for audio boost. The audio signal is developed across R38 (high resistance); with little attenuation across series resistor R40 (low resistance).

When a carrier signal is received on a non-priority channel, the dc output of squelch circuit Q21 inhibits the high speed clock through CR3 and CR4. The scanning action stops on the frequency where the carrier was received, and the message is heard. However, the unit continues to scan the priority channel each 250 milliseconds for a 6 millisecond period. If signal is present on the priority channel, the unit will revert to the priority channel. This is possible because of the following actions:

- The squelch output of Q21 stops the high speed clock and the AND gate inhibits CR101.

- Since the output of Q6 is high during each non-priority channel scan period, it remains high during non-priority channel monitoring. Therefore, Q13 is activated and the slow speed clock output continues to be fed to the high speed clock.

- The slow speed clock (250 milliseconds) triggers the high speed clock for one 6-millisecond pulse. The resultant positive pulse from Q6 is coupled through Q8 and priority select switch Q106 (which overrides the priority channel NAND gate) and activates the priority channel frequency for 6 milliseconds.


-FREQUENCY BOARD
NOT USED
2
FIRST CLOCK BISTABLE MULTIVIBRATOR
Q101 Q102
SECOND CLOCK BISTABLE MULTIVIBRATOR
Q103 Q104
DRIVER
Q2
PRIORITY DRIVER LAMP INDICATOR
Q1
3 INPUT NAND GATE
Q107
3 INPUT NAND GATE
Q110
3 INPUT NAND GATE
Q113
3 INPUT NAND GATE
Q116
LAMP BLANKER
Q9 & Q10
CHANNEL ELEMENT DRIVER
Q108 & Q109
CHANNEL ELEMENT DRIVER
Q111 & Q112
CHANNEL ELEMENT DRIVER
Q114 & Q115
CHANNEL ELEMENT DRIVER
Q117 & Q118
ARM OF SQUELCH CONTROL
24
6 CHANNEL ELEMENT
F1
8 CHANNEL ELEMENT
F2
10 CHANNEL ELEMENT
F3
12 CHANNEL ELEMENT
F4
EXCITER AUDIO INPUT
46

as described previously except that the signal will be heard only if it is coded with the proper PL tone, or the PL switch is OFF.

3. FUNCTIONAL OPERATION

a. General

Refer to the block diagram. Applying power to the unit starts slow speed clock multivibrator Q11 and Q12. The slow speed clock output starts the high speed clock through AND gate CR7 to Q4. The high speed clock includes multivibrator Q4 and Q6, and monostables Q5 and Q7, which are connected in a feedback loop through inhibit diodes CR3 and CR4. With no received carrier signal, the high speed clock changes state each 6 milliseconds. This square wave switching signal is coupled through clock driver Q8 to the 3-input NAND gates Q107, Q110, Q113, and Q116 and to the second clock multivibrators Q101, Q102, Q103 and Q104. The output of Q8 is also applied to priority select switch Q106. During the positive portion of each pulse, the priority select switch Q106 is activated and overrides the NAND gates, thus forcing the priority channel to be selected. During the negative portion of each pulse, Q106 is cut off and the second clock multivibrators and NAND gates operate as a count-down circuit to sequentially select each channel. The resultant scanning action follows this scanning sequence--priority channel - F1 - priority - F2 - priority - F3 - priority - F4.

During scan, the output of high speed clock monostables Q5 and Q7 activate audio mute switch Q14 which mutes the receiver audio output during scan. Squelch buffer amplifier Q201 and Q202 also mute the receiver during scan operation by grounding the PL disable point in the receiver audio circuit. During scan, lamp blankers Q9 and Q10 inhibit priority lamp driver Q1 to keep the light extinguished.

An input from the receiver SQUELCH control is applied to squelch circuit Q16 through Q21. When no carrier signal is received, the noise input results in +4 volts dc voltage output from the squelch circuit. When the unit scans a frequency with a signal present, there is no (or very little) noise input and the squelch circuit produces A+ (+12 V) dc voltage output. The setting of the SQUELCH control adjusts the sensitivity of the "Channel-Scan" monitor as well as the receiver. The unit will not stop scanning and lock-on to a carrier unless the carrier exceeds the squelch threshold level of the "Channel-Scan" monitor.

When a priority channel signal is received, the dc output of squelch circuit Q21 stops the high speed clock through CR3 and CR4 (the feedback path is interrupted). The scanning action stops and the message on that channel is heard. A number of simultaneous steps are required to accomplish this action. as follows:

Since the output of Q6 is always low during the priority channel scan periods, it is low when scanning stops in the priority channel. This voltage cuts off priority clock inhibit switch Q13 which back biases CR7 to block the output of the slow speed clock.

- Audio mute switch Q14 unmutes the receiver audio.

- The squelch output inhibits scanning through AND gate inhibit CR101.

- Lamp blanker Q9 and Q10 are deactivated which allows Q1 to operate and turn on the PRIORITY lamp.

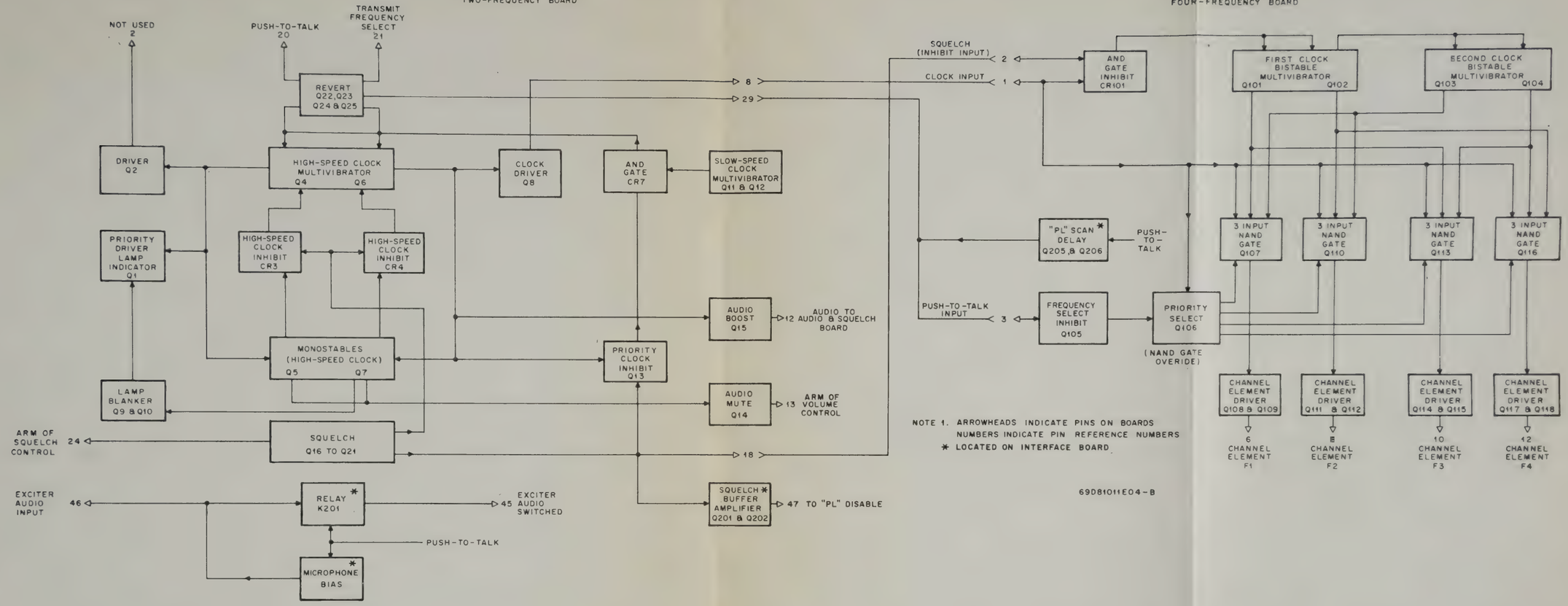
- As shipped from the factory, all present units are wired so that priority and non-priority channel audio is heard at the same level. In all early units, and in present units jumpered for audio boost operation, priority channel audio is boosted. The low from Q6 cuts off Q15 for audio boost. The audio signal is developed across R38 (high resistance); with little attenuation across series resistor R40 (low resistance).

When a carrier signal is received on a non-priority channel, the dc output of squelch circuit Q21 inhibits the high speed clock through CR3 and CR4. The scanning action stops on the frequency where the carrier was received, and the message is heard. However, the unit continues to scan the priority channel each 250 milliseconds for a 6 millisecond period. If signal is present on the priority channel, the unit will revert to the priority channel. This is possible because of the following actions:

- The squelch output of Q21 stops the high speed clock and the AND gate inhibits CR101.

- Since the output of Q6 is high during each non-priority channel scan period, it remains high during non-priority channel monitoring. Therefore, Q13 is activated and the slow speed clock output continues to be fed to the high speed clock.

- The slow speed clock (250 milliseconds) triggers the high speed clock for one 6-millisecond pulse. The resultant positive pulse from Q6 is coupled through Q8 and priority select switch Q106 (which overrides the priority channel NAND gate) and activates the priority channel frequency for 6 milliseconds.



"Channel-Scan" Monitor Block Diagram

● If no carrier is present on the priority channel the unit reverts to the non-priority channel with signal. The squelch output of Q21 does not decay sufficiently in 6 milliseconds to forward bias AND gate inhibit CR101. Therefore, the non-priority channel with signal will still be selected after the 6-millisecond priority sampling.

● The lamp blanker Q9 and Q10 is activated to keep the PRIORITY light off.

● Audio is unmuted, just as for priority channel operation.

● If a priority channel signal is received during the 6-millisecond sampling period, the unit locks on as described previously for priority channel operation.

● In early units and all present units jumpered for audio boost operation, non-priority audio is heard at a lower level than priority channel audio. The high from Q6 turns on Q15 and the audio signal developed across R38 (high resistance) is shunted by R39 (low resistance). As a result, series R40 acts as an attenuator and sharply reduces the audio level.

When the transmitter push-to-talk switch is operated, the high speed clock is totally inhibited to prevent scanning by Q22 and Q23. Additionally, it is coupled to frequency select inhibit Q105 which further protects against scanning by disabling the second clock multivibrators through CR101. This assures that the monitored channel will still be selected when the push-to-talk switch is released. In "Private-Line" radios, the PL scan delay Q205 and Q206 holds the unit in a non-scan mode for 300 milliseconds (past the duration of the reverse burst). On carrier squelch models, a jumper is removed to disable Q205 and Q206 and eliminate the delay.

During transmit operation, relay K201 is closed to complete the audio path from the microphone circuit to the exciter. An alternate source of microphone bias is provided by Q203 and Q204 for applications requiring the bias for intercom operation.

When the SCAN ON-SCAN OFF switch is in the SCAN OFF position, the high speed clock is inhibited and placed in the "priority" condition. This allows the PRIORITY frequency switch to become a receiver frequency selector.

b. Squelch Circuit

(Refer to the schematic diagram.)

The "Channel-Scan" monitor unit receives its input from the arm of the squelch control on the control panel which allows the noise input level to be adjusted to the desired threshold level. This input consists of discriminator noise which drives the squelch limiter stage between saturation and cut-off. When no carrier is detected by the receiver, the high-frequency noise present on the channel will exceed the threshold level of the amplifier-switch driving it into saturation during the noise pulses. As the carrier strength increases, less high frequency noise will exceed the threshold level. The pulsed output of the amplifier-switch circuit is fed to the differentiating network, and coupled through it to the pulse generator input in the form of sharp pulses.

The pulse generator is a monostable multivibrator. Transistor Q18 is cut off and Q19 is conducting in saturation when the pulse generator is in the quiescent condition. Each of the pulses from the amplifier-switch and differentiating network will produce a negative pulse of approximately 75-microsecond duration at the collector of transistor Q18. With a high noise level from the receiver, the pulses will be closely spaced, and as receiver quieting increases, the pulses will become fewer in number.

These negative pulses are fed to a low pass filter which presents an average dc level to the base of transistor Q20, biasing it into cut off and allowing transistor Q21 to conduct. Therefore, the more pulses which are fed to the base of Q20, the harder Q21 will conduct, effectively giving a tighter squelch sensitivity. When a carrier is received with the resultant increased absence of noise, the pulses become fewer, and transistor Q20 is biased into conduction. Transistor Q20 then applies A+ to the emitter of Q21, biasing it into cut-off.

c. High Speed and Low Speed Clock Circuits

When A+ is applied to the monitor unit, the slow-speed clock multivibrator (Q11 and Q12) starts running. The high-speed clock, however, is not self-starting. It is started by a negative pulse from the collector of Q11 through AND gate diode CR7 and diodes CR2 and CR5 to the collectors of Q4 and Q6. This clock pulse will be applied only when collector Q21 is near ground, allowing CR7 to be forward biased and the pulse to pass. This potential on Q21 is also applied to diodes CR3 and CR4, (the high speed clock inhibit diodes) forward biasing them. This completes the feedback path between the high speed clock multivibrator transistor, either Q4 or Q6, and its associated monostable multivibrator, Q5 or Q7.

Monostable multivibrator transistors Q5 and Q7 are normally in the on (or saturated) state. When a clock pulse from the slow-speed clock is applied to the collectors of the high speed clock

multivibrator, it will change states at intervals of approximately 6 milliseconds. This occurs when either Q4 or Q6 is turned off, which allows a pulse to be passed through C_2 or C_7 biasing either Q5 or Q7 (the monostable multivibrator transistor) into the off or non-conducting state. It will stay off for 6 milliseconds, at which time it will turn back on, changing the state of the high speed clock multivibrator. This action continues at the 6 millisecond rate until an rf carrier is received.

Assume that the first rf carrier received is a priority carrier. The absence of pulses at the base of Q20 causes Q21 to be cut off, allowing its collector to go to A+. This applies an inhibit voltage to diodes CR3 and CR4 through resistors R10 and R11, opening the feedback path and stopping the high speed clock multivibrator. The inhibit voltage is also applied to AND gate diode CR7 through diode CR8, back-biasing it and permitting no slow-speed clock pulses to be passed. The audio and squelch board of the radio is turned on by the positive voltage fed through diode CR8.

If the carrier received is on a non-priority channel, transistor Q13 is biased into conduction and the slow-speed clock and gate inhibit voltage is shunted to ground through R29 and Q13. This allows the slow speed pulses to be passed by CR7, CR2 and CR5, causing the high speed clock multivibrator to be switched to the priority channel to sample it for a carrier.

When the unit is sampling the non-priority channel, a positive voltage from the collector of Q6 turns on the priority clock inhibit transistor. This prevents diode CR7 from becoming back-biased, and allows slow-speed clock pulses to be fed to the high speed clock multivibrator to change its state. This allows the priority channel to be sampled when a carrier is present on the non-priority channel. When the priority channel is being sampled, no positive voltage is applied to this transistor, and it allows the squelch voltage to inhibit the application of slow-speed clock pulses by back-biasing diode CR7.

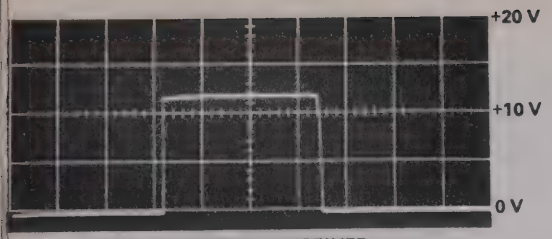
As the high-speed clock monostables change state they apply a positive voltage to the base of transistor Q14 through either R34 or R35, biasing it into conduction. Transistor Q14 acts as a shunt switch between the arm of the VOLUME control and the audio shield. This provides a muting action so that no noise bursts are heard when sampling the priority channel for the presence of a carrier.

d. Second Clock and NAND Gate Circuits

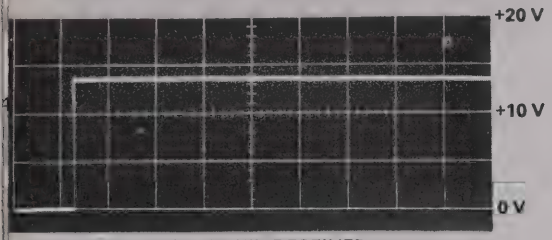
The clock pulse from the clock driver Q8 is coupled through CR101, CR102, and CR103 to the first clock multivibrator Q101 and Q102. The collector of transistor Q102 then has a pulse rate of one-half the clock pulse from the high speed clock. This pulse is coupled through to the second clock multivibrator Q103 and Q104, resulting in a pulse at either of the transistors in it of one-half the pulse rate of the first clock multivibrator.

The negative portion of the clock pulse from the two-frequency board is also coupled to the resistive NAND gates at the bases of transistors Q107, Q110, Q113, and Q116. If it arrives at the same time as the other low inputs required from the clock multivibrators, it will bias the associated transistor into conduction. This will turn on the channel element driver which supplies a switched ground to turn on the channel element. The positive portion of the clock pulse is applied to the base of priority select transistor Q106, turning it on. The resultant switched ground is applied through the priority selector switch to the over-ride input of the priority channel NAND gate transistor, biasing it on. This means that the non-priority channels are checked in turn during succeeding negative periods of the clock pulse, and the priority channel is checked during each positive period of the clock pulse.

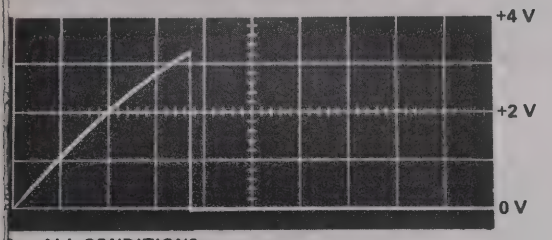
When a non-priority carrier is detected, the squelch circuit applies an inhibit signal which biases CR1 into cut-off. This blocks the clock multivibrators, locking the unit on channel by fixing the inputs on the NAND gates. Since the low speed clock continues to run, the clock pulses are still fed to this board. The positive half of the clock turns on transistor Q106, which allows the unit to sample the priority channel until a priority carrier is received, at which time the slow speed clock will be stopped.



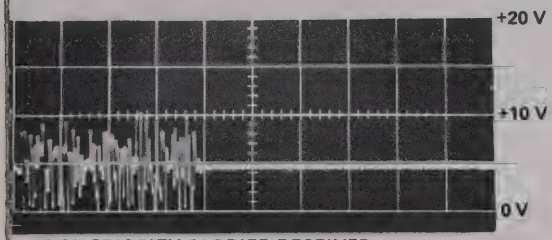
NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



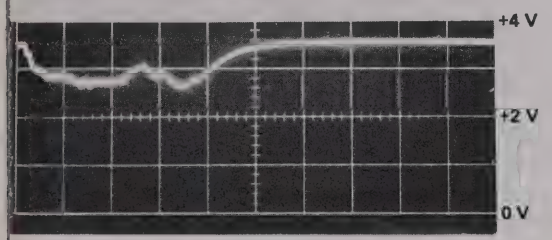
NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 5.0 ms/cm



2. ALL CONDITIONS
HORIZONTAL = 2.0 ms/cm



6. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



9. NON-PRIORITY CARRIER RECEIVED
(APPROX. 40 dB QUIETING)
HORIZONTAL = 2.0 ms/cm

LATER VERSION

"CHANNEL-SCAN" MONITOR

CEPS-3312-O

TLN4857A-1 Two-Frequency Board
Circuit Board Detail
Motorola No. PEPS-11578-O
6/22/73-UP

multivibrator, it will change states at intervals of approximately 6 milliseconds. This occurs when either Q4 or Q6 is turned off, which allows a pulse to be passed through C_2 or C_7 biasing either Q5 or Q7 (the monostable multivibrator transistor) into the off or non-conducting state. It will stay off for 6 milliseconds, at which time it will turn back on, changing the state of the high speed clock multivibrator. This action continues at the 6 millisecond rate until an rf carrier is received.

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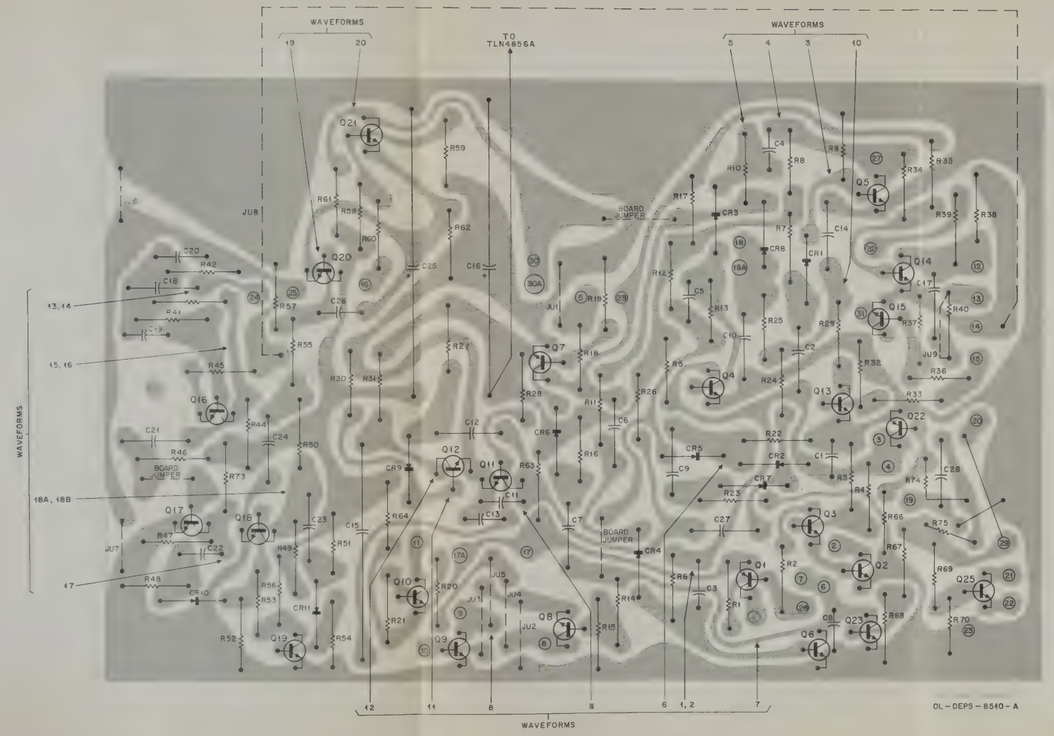
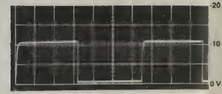
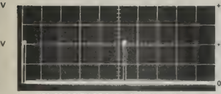
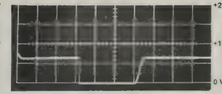




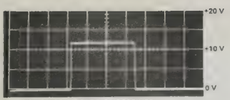
1. NO RF CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



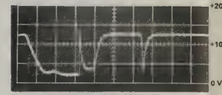
2. NON-PRIORITY RF CARRIER RECEIVED
HORIZONTAL = 50 ms/cm



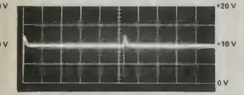
3. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



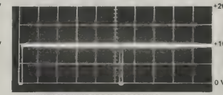
4. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



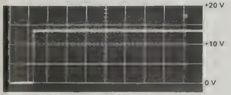
5. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



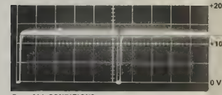
6. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 50 ms/cm



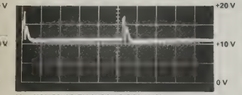
7. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 50 ms/cm



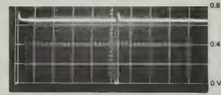
8. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 5.0 ms/cm



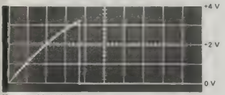
9. ALL CONDITIONS
HORIZONTAL = 50 ms/cm



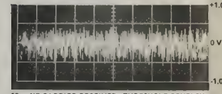
10. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 50 ms/cm



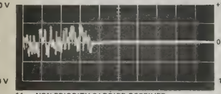
11. ALL CONDITIONS
HORIZONTAL = 50 ms/cm



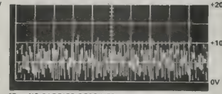
12. ALL CONDITIONS
HORIZONTAL = 2.0 ms/cm



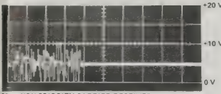
13. NO CARRIER RECEIVED - THRESHOLD SQUELCH
HORIZONTAL = 20 ms/cm



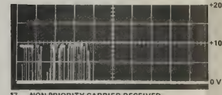
14. NON-PRIORITY CARRIER RECEIVED
(APPROX. 40 dB QUIETING)
HORIZONTAL = 2.0 ms/cm



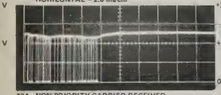
15. NO CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



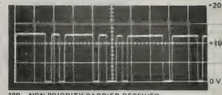
16. NON-PRIORITY CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



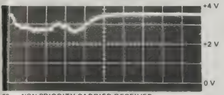
17. NON-PRIORITY CARRIER RECEIVED
(APPROX. 40 dB QUIETING)
HORIZONTAL = 2.0 ms/cm



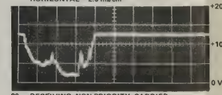
18A. NON-PRIORITY CARRIER RECEIVED
(APPROX. 40 dB QUIETING)
HORIZONTAL = 2.0 ms/cm



18B. NON-PRIORITY CARRIER RECEIVED
(APPROX. 40 dB QUIETING)
HORIZONTAL = 0.2 ms/cm



19. NON-PRIORITY CARRIER RECEIVED
(APPROX. 40 dB QUIETING)
HORIZONTAL = 2.0 ms/cm



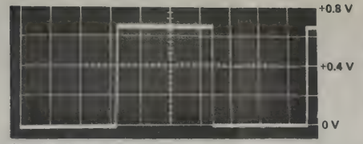
20. RECEIVING NON-PRIORITY CARRIER
(APPROX. 40 dB QUIETING)
HORIZONTAL = 2.0 ms/cm

CEPS-4312-O

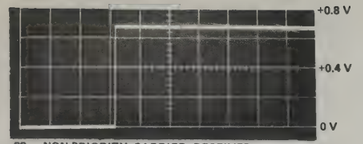
LATER VERSION

"CHANNEL SCAN" MONITOR

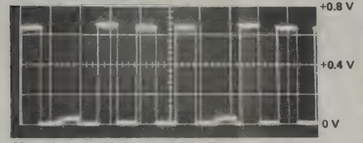
TLN4857A-1 Two-Frequency Board
Circuit Board Detail
Motorola No. PEPS-11578-O
6/22/71-UP



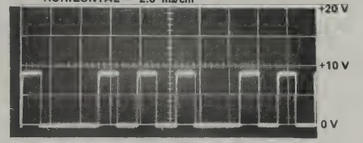
21. NO CARRIER RECEIVED
HORIZONTAL = 2.0 ms/cm



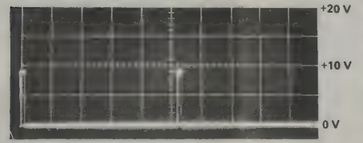
22. NON-PRIORITY CARRIER RECEIVED
(APPROX. 40 dB QUIETING)
HORIZONTAL = 2.0 ms/cm



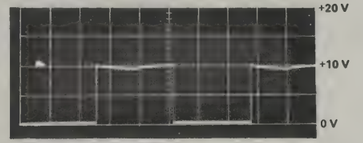
23. NO CARRIER PRESENT
HORIZONTAL = 10 ms/cm



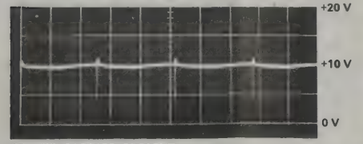
24. NO CARRIER PRESENT
HORIZONTAL = 10 ms/cm



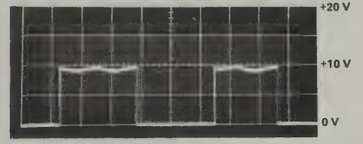
25. RECEIVING NON-PRIORITY CARRIER
HORIZONTAL = 50 ms/cm



26. NO CARRIER PRESENT
HORIZONTAL = 5 ms/cm



27. NO CARRIER PRESENT
HORIZONTAL = 5.0 ms/cm



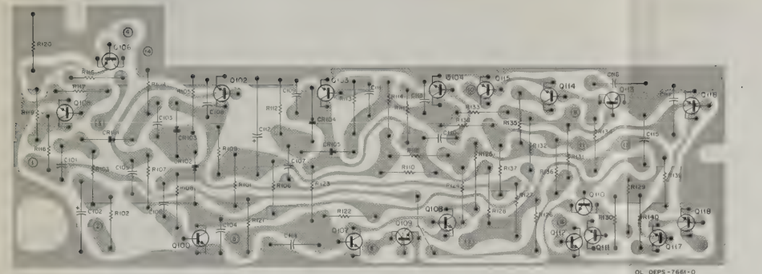
28. NO CARRIER PRESENT
HORIZONTAL = 10 ms/cm

BEPS-3313-O

"CHANNEL-SCAN" MONITOR

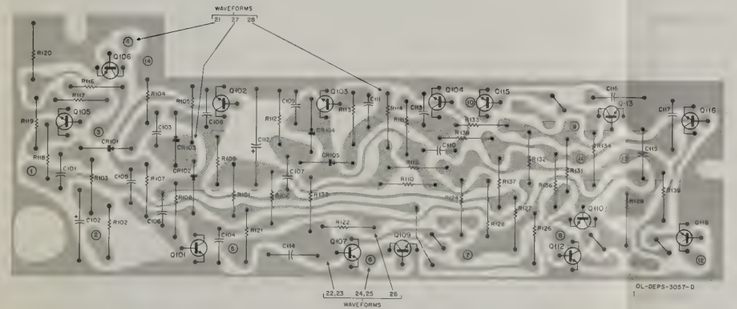
Four-Frequency Board
Circuit Board Detail
Motorola No. PEPS-4523-C
6/22/73-UP

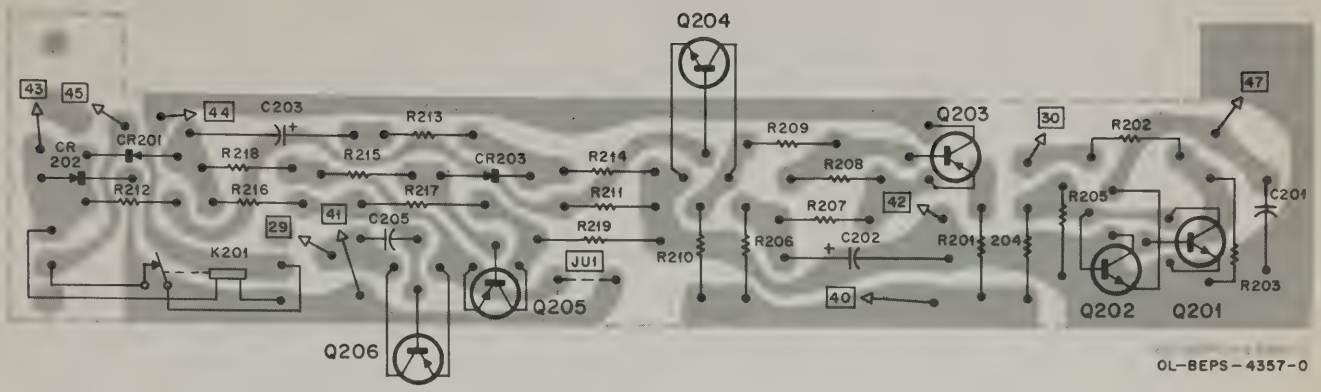
VERSION 1
TLN4243A-O



VERSION 2

TLN4243A-1 OR LATER
AND TLN5002A

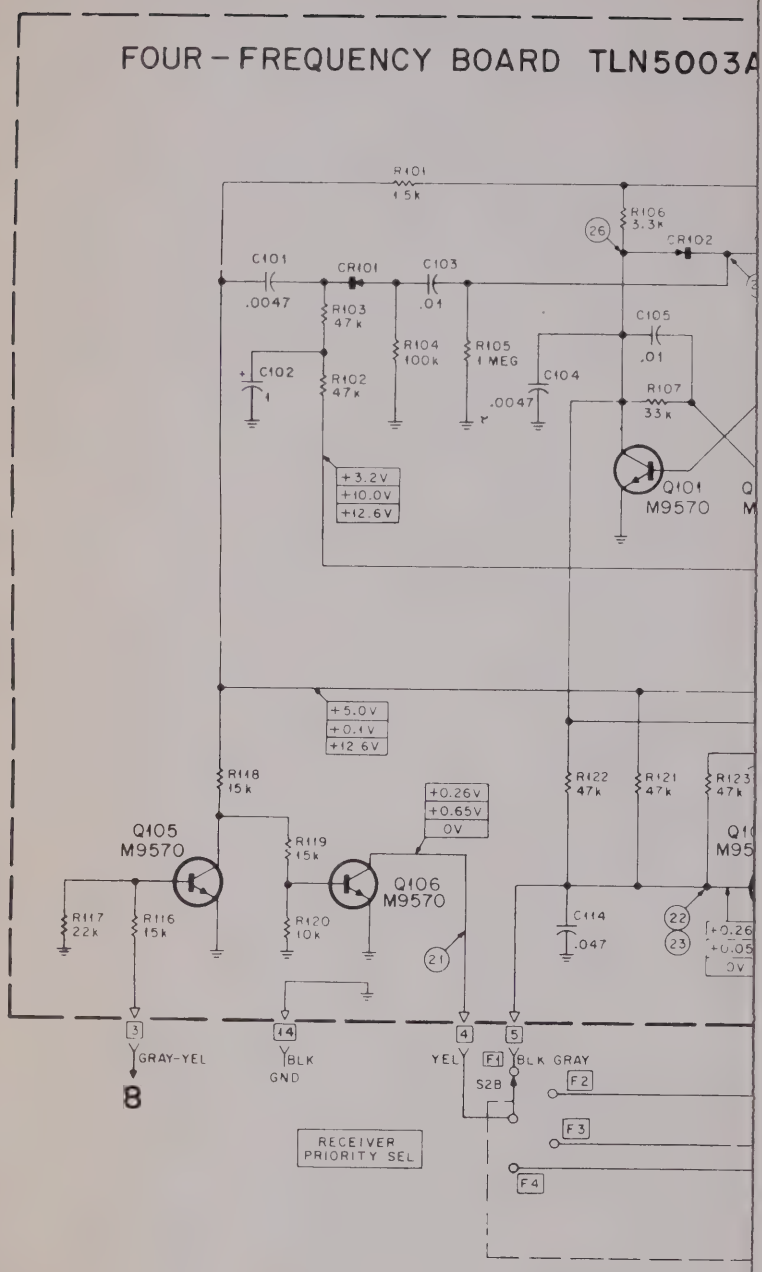




OL-8EPS-4357-0

"CHANNEL-SCAN" MONITOR

Interface Circuit Board Detail
Motorola No. PEPS-4524-O
2/7/73-UP



LATER VERSION

TLN1372A-1

"Channel-Scan" Monitor
Schematic Diagram
Motorola No. 63P81019E74-A
(Sheet 1 of 2)
6/22/73-UP

ERS IS USED ON THIS

MICROFARADS UNLESS

MS UNLESS OTHERWISE

ELATION TO CHASSIS
HE RADIO SET AND THE
SCAN SWITCH IN THE

O RF CARRIERS PRESENT
NON-PRIORITY CHANNEL
PRIORITY CHANNEL

ODEL AND INSTALLATION

E MODE
MIT MODE

ODE ONLY, REFER TO
26 FOR RECEIVE MODE.
INTERFACE BOARD IS

FER TO CORRESPONDING
IS.
E LEVEL AS NON-PRIORITY
UT JU9 AND CONNECT
CH TO PIN 32 ON

EPS-11577-A

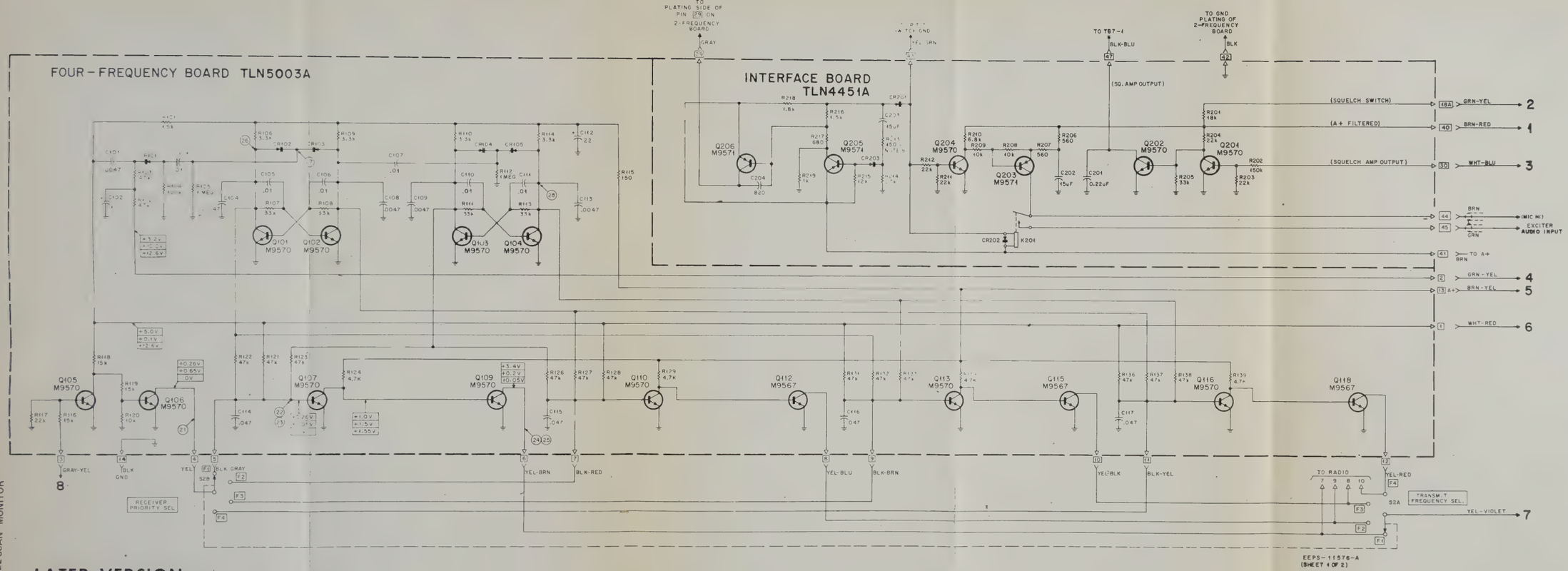
LATER VERSION

TLN1372A-1

"CHANNEL-SCAN" MONITOR

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

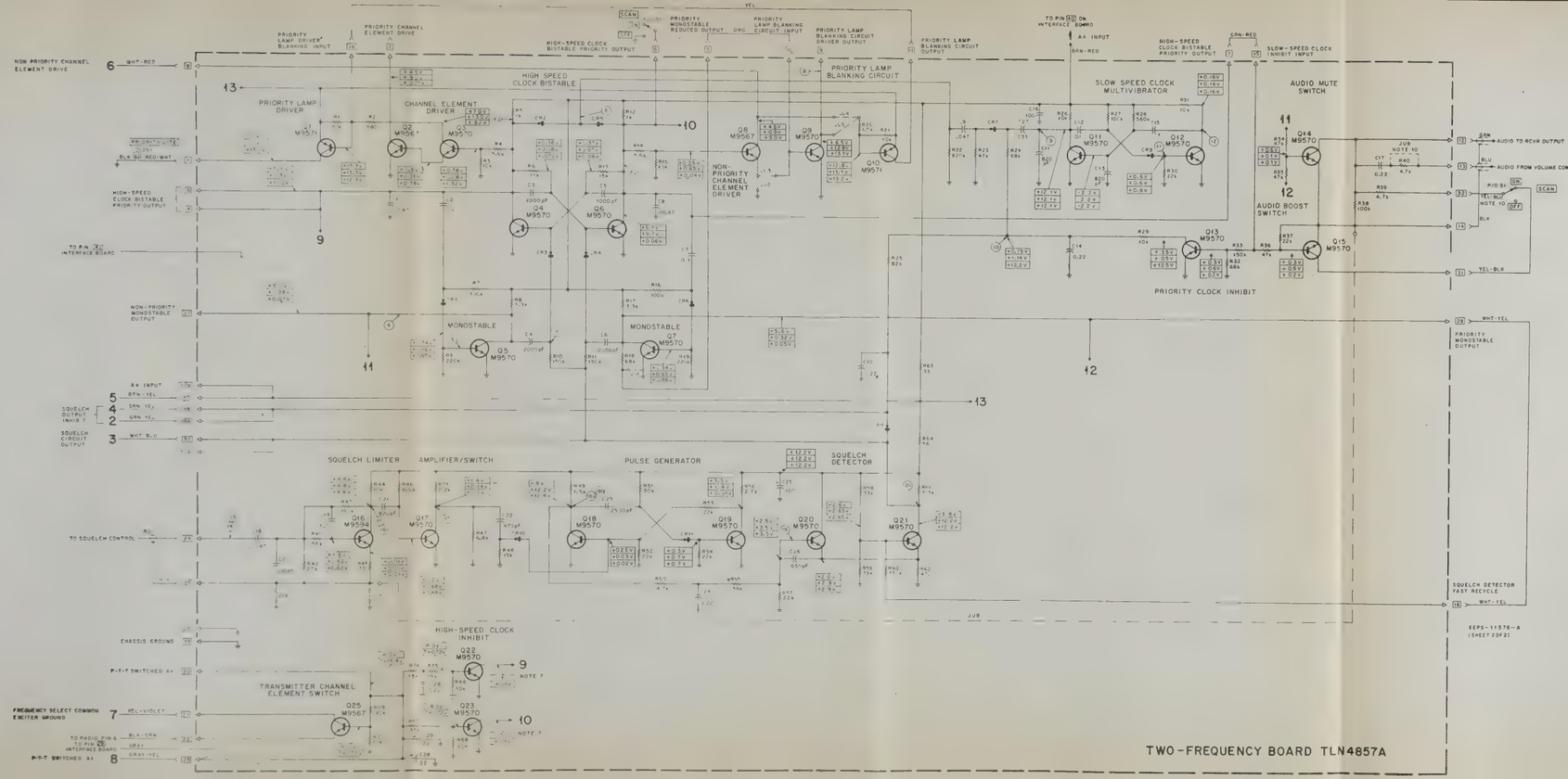
"Channel-Scan" Monitor
Schematic Diagram
Motorola No. 63P81019E74-A
(Sheet 2 of 2)
6/22/73-UP



LATER VERSION

TLN1372A-1

"Channel-Scan" Monitor
Schematic Diagram
Motorola No. 63P81019E74-A
(Sheet 1 of 2)
6/22/73-UP



NOTES.

1. THE FOLLOWING COMBINATION OF JUMPERS IS USED ON THIS BOARD.

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

2. ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS [illegible] OTHERWISE NOTED. pF = PICOFARADS
3. ALL RESISTOR VALUES ARE GIVEN IN OHMS UNLESS OTHERWISE NOTED. K = KILOHMS.
4. ALL VOLTAGE MEASUREMENTS ARE IN RELATION TO CHASSIS GROUND WITH +11.8 V DC APPLIED TO THE RADIO SET AND THE SQUELCH CONTROL SET AT THRESHOLD, [illegible] SWITCH IN THE "SCAN" POSITION.
   - UNIT SCANNING - [illegible] CARRIERS PRESENT
   - UNIT RECEIVING A [illegible] PRIORITY CHANNEL
   - UNIT RECEIVING A PRIORITY CHANNEL
5. VOLTAGE AT THIS POINT VARIES WITH M[illegible] AND INSTALLATION OPTION USED.
6. VOLTAGE IN RECEIVE MODE
   VOLTAGE IN TRANSMIT MODE
7. VOLTAGES SHOWN ARE FOR TRANSMIT M[illegible] REFER TO VOLTAGES ON COLLECTORS OF Q4 AND Q[illegible] RECEIVE MODE
8. RESISTOR R213 MUST BE REMOVED WHEN [illegible]ERFACE BOARD IS USED WITH CARRIER SQUELCH STATIONS
9. ENCIRCLED NUMBERS ON SCHEMATIC REFER T[illegible] CORRESPONDING NUMBERED OSCILLOSCOPE PHOTOGRAPH
10. AS SHIPPED, PRIORITY AUDIO IS AT SAM[illegible] AS NON-PRIORITY AUDIO. TO "BOOST" PRIORITY AUDIO, C[illegible] AND CONNECT YEL-BLU WIRE FROM SCAN ON-OFF SWITCH TO PIN [32] ON 2-FREQUENCY BOARD.

EPS-11577-A

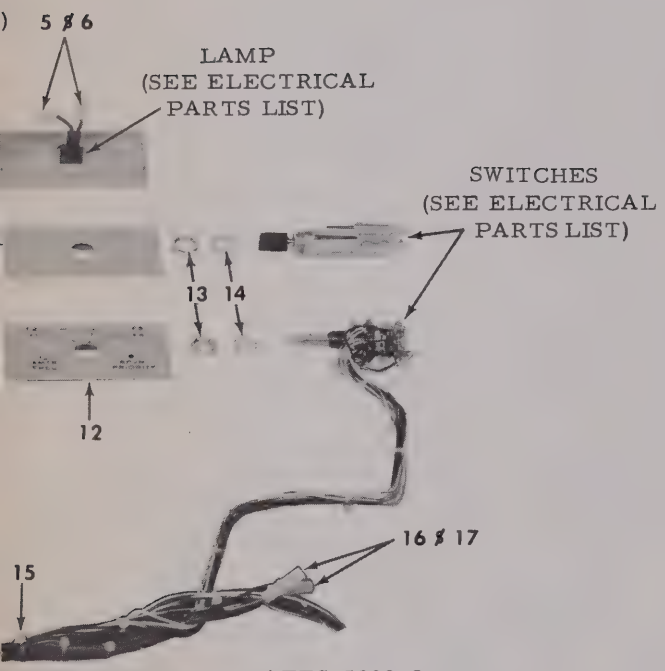
LATER VERSION

TLN1372A-1

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

"Channel-Scan" Monitor
Schematic Diagram
Motorola No. 63P81019E74-A
(Sheet 2 of 2)
6/22/73-UP

"CHANNEL-SCAN" MONITOR


5 & 6
LAMP
(SEE ELECTRICAL
PARTS LIST)
SWITCHES
(SEE ELECTRICAL
PARTS LIST)
13
14
12
16 & 17
15

AEPS-5399-O

EARLIER VERSION
TLN1372A

"CHANNEL-SCAN" MONITOR

TLN4242A-2 Two-Frequency Board
Circuit Board Detail
Motorola No. PEPS-4522-C
6/22/73-UP

REVISIONS

63P81019E74-O

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
TLN1372A-1		MODEL TLN4857A TWO-FREQUENCY BOARD REPLACES MODEL TLN4242A.		PEPS-11578-O
	[illegible]	FROM Z1D83214C07, .22 uF TO 8-82905G11, 0.22 uF.	[illegible]	
	C24	REMOVED Z1D83214C07, 22 uF, WAS CONNECTED BETWEEN GROUND AND JUNCTION OF R67, R87.		
	[illegible]	REMOVED 4R869571, [illegible]	[illegible]	
	[illegible]	ADDED 6-129236, 15k CIRCUIT WAS AS SHOWN BELOW:	Q27 BASE	

PARTS LIST

TLN1372A "Channel-Scan" Monitor PL-2353-O

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		CAPACITOR, fixed uF ±10% unl. stated
[illegible]	Z1D83428B09	.0047; 100 V
[illegible]	8-82905G07	0.1; 50 V
[illegible]	Z1D82537B16	1000 pF ±5%; 100 V
[illegible]	Z1K85994	2000 pF ±5%; 500 V
[illegible]	Z1D82537B16	1000 pF ±5%; 100 V
[illegible]	Z1K85994	2000 pF ±5%; 500 V
[illegible]	8D82905G07	0.1; 50 V
[illegible]	Z1D82428B09	.0047; 100 V
[illegible]	8D82905G11	.047; 50 V
[illegible]	8D82905G07	0.22; 50 V
[illegible]	Z1D82187B21	820 pF; 200 V
[illegible]	8D82905G07	0.1; 50 V
[illegible]	Z1D82187B21	820 pF; 200 V
[illegible]	8D82905G11	0.22; 50 V
[illegible]	8K86106	1.0; 100 V
[illegible]	Z1D83210A08	100 +150-10%; 25 V
[illegible]	8D82905G11	0.22; 50 V
[illegible]	8D82905G26	.0047; 100 V
[illegible]	Z1K85018	100 pF ±5%; 100 V
[illegible]	Z1D82187B18	1500 pF; 100 V
[illegible]	[illegible]	470 pF ±2%; 100 V
[illegible]	[illegible]	470 pF ±5%; 100 V
[illegible]	[illegible]	2500 pF ±2%; 500 V
[illegible]	8-82905G11	0.22; 50 V
[illegible]	Z1D83210A08	100 +150-10%; 25 V
[illegible]	Z1K84826	650 pF ±5%; 300 V
[illegible]	8D82905G08	.033; 25 V
[illegible]	[illegible] 05C11	[illegible] 50 V
[illegible]	[illegible] 428B09	.0047; 100 V
[illegible]	[illegible] D83214C04	1.0 ±20%; 15 V
[illegible]	[illegible]	.01 +80-20%; 200 V
[illegible]	[illegible] 428B09	.0047; 100 V
[illegible]	Z1D82428B59	.01 +80-20%; 200 V
[illegible]	Z1D82428B59	.01 +80-20%; 200 V
[illegible]	[illegible] 428B09	.0047; 100 V
[illegible]	[illegible] 428B09	.0047; 100 V
[illegible]	[illegible] 428B59	.01 +80-20%; 200 V
[illegible]	Z1D82428B59	.01 +80-20%; 200 V
[illegible]	Z1D83214C07	22 ±20%; 15 V
[illegible]	Z1D82128B09	.0047; 100 V
[illegible]	8D82905G01	.047; 50 V
[illegible]	8D82905G01	.047; 50 V
[illegible]	[illegible]	.047; 50 V
[illegible]	[illegible]	.047; 50 V
[illegible]	[illegible]	0.22; 50 V
[illegible]	[illegible]	15 ±20%; 25 V
[illegible]	[illegible]	15 ±5%; 20 V
[illegible]	Z1D82187B21	820 pF ±10%; 200 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
[illegible]	48D82392B03	silicon
[illegible]	[illegible] 2B03	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	48D82392B03	silicon
[illegible]	48D82392B03	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	48D82392B03	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	silicon
[illegible]	[illegible]	LIGHT, indicator: 14 V; .08 A; incl[illegible] AMBER lens; connecting leads and mounting hardware; does not include 4A84121C01 WASHER, mounting
[illegible]	[illegible]	RELAY, magnetic reed, [illegible]

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
[illegible]	6S129144	68k
[illegible]	6S129146	150k
[illegible]	6S131527	47k ±5%
[illegible]	6S131527	47k ±5%
[illegible]	6S128902	47k
[illegible]	6S128685	22k
[illegible]	6S129226	100k
[illegible]	6S127804	4.7k
[illegible]	6S127804	4.7k
[illegible]	6S128644	56k ±5%
[illegible]	6S127806	27k
[illegible]	6S128683	150k ±5%
[illegible]	6S129068	10k ±5%
[illegible]	[illegible]	33
[illegible]	6S124A97	100k ±5%
[illegible]	6S128687	6.8k
[illegible]	6S127805	15k
[illegible]	6S129681	1.5k ±5%
[illegible]	6S129669	4.7k ±5%
[illegible]	6S124A84	30k ±5%
[illegible]	6S129667	22k ±5%
[illegible]	[illegible]	22k ±5%
[illegible]	6S129667	22k ±5%
[illegible]	6S129777	39k ±5%
[illegible]	6S129707	2.7k ±5%
[illegible]	6S129667	22k ±5%
[illegible]	6S129526	33k ±5%
[illegible]	6S129668	10k ±5%
[illegible]	6S129473	330k ±5%
[illegible]	6S129681	1.5k ±5%
[illegible]	[illegible]	470 ±5%
[illegible]	6S129754	51
[illegible]	6S129800	56
[illegible]	6S129225	10k
[illegible]	6S127807	33k
[illegible]	6S129526	10k
[illegible]	6S129668	10k ±5%
[illegible]	6S129225	10k
[illegible]	6S129804	2.2k ±5%
[illegible]	6-129236	15k ±5%
[illegible]	6-129236	15k ±5%
[illegible]	6S127801	1.5k
[illegible]	6S128902	47k
[illegible]	6S128902	47k
[illegible]	6S129226	100k
[illegible]	6S129013	1 meg
[illegible]	6S129981	3.3k ±5%
[illegible]	6S129526	33k ±5%
[illegible]	6S129526	33k ±5%
[illegible]	6S129981	3.3k ±5%
[illegible]	6S129981	3.3k ±5%
[illegible]	6S129526	33k ±5%
[illegible]	6S129013	1 meg
[illegible]	6S129526	33k ±5%
[illegible]	6S129981	3.3k ±5%
[illegible]	[illegible]	150
[illegible]	[illegible]	15k
[illegible]	6S127805	15k
[illegible]	6S128685	22k
[illegible]	6S127805	15k
[illegible]	6S127805	15k
[illegible]	6S129225	10k
[illegible]	6S131527	47k ±5%
[illegible]	6S131527	47k ±5%
[illegible]	6S127804	4.7k
[illegible]	[illegible]	
[illegible]	6S131527	47k ±5%
[illegible]	6S131527	47k ±5%
[illegible]	6S131527	47k ±5%
[illegible]	6S127804	4.7k
[illegible]	[illegible]	
[illegible]	6S131527	47k ±5%
[illegible]	6S131527	47k ±5%
[illegible]	6S131527	47k ±5%
[illegible]	6S127801	4.7k
[illegible]	[illegible]	
[illegible]	6S128904	18k

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		TRANSISTOR: (SEE NOTE)
Q1	48R869571	PNP; type M9571
Q2	48R869567	NPN; type M9567
Q3	48R869570	NPN; type M9570
Q4	48R869570	NPN; type M9570
Q5	48R869570	NPN; type M9570
Q6	48R869570	NPN; type M9570
Q7	48R869570	NPN; type M9570
Q8	48R869567	NPN; type M9567
Q9	48R869570	NPN; type M9570
Q10	48R869571	PNP; type M9571
Q11	48R869570	NPN; type M9570
Q12	48R869570	NPN; type M9570
Q13	48R869570	NPN; type M9570
Q14	48R869570	NPN; type M9570
Q15	48T869570	NPN; type M9570
Q16	48R869594	NPN; type M9594
Q17	48R869570	NPN; type M9570
Q18	48R869570	NPN; type M9570
Q19	48R869570	NPN; type M9570
Q20	48R869570	NPN; type M9570
Q21	48R869570	NPN; type M9570
Q22	48R869570	NPN; type M9570
Q23	48R869570	NPN; type M9570
Q25	48R869567	NPN; type M9567
Q101	48R869570	NPN; type M9570
Q102	48R869570	NPN; type M9570
Q103	48R869570	NPN; type M9570
Q104	48R869570	NPN; type M9570
Q105	48R869570	NPN; type M9570
Q106	48R869570	NPN; type M9570
Q107	48R869570	NPN; type M9570
Q109	48R869527	NPN; type M9567
Q110	48R869570	NPN; type M9570
Q112	48R869567	NPN; type M9567
Q113	48R869570	NPN; type M9570
Q115	48R869567	NPN; type M9567
Q116	48R869570	NPN; type M9570
Q118	48R869567	NPN; type M9567
Q201	48R869570	NPN; type M9570
Q202	48R869570	NPN; type M9570
Q203	48R869571	PNP; type M9571
Q204	48R869570	NPN; type M9570
Q205	48R869571	PNP; type M9571
Q206	48R869571	PNP; type M9571
		RESISTOR, fixed: ±10%; 1/4 W, unl. stated
R1	6S129225	10k
R2	6S128390	680
R3	6S129225	10k
R4	6S129433	5.6k
R5	6S129805	1k ±5%
R6	6S129236	15k ±5%
R7	6S124A97	100k ±5%
R8	6S129981	3.3k ±5%
R9	6S129147	220k
R10	6S128683	150k ±5%
R11	6S128683	150k ±5%
R12	6S129805	1k ±5%
R13	6S129236	15k ±5%
R14	6S129433	5.6k
R15	6S129225	10k
R16	6S124A97	100k ±5%
R17	6S129981	3.3k ±5%
R18	6S129144	68k
R19	6S129147	220k
R20	6S127803	1.5k
R21	6S129225	10k
R22	6S129012	820k
R23	6S128902	47k
R24	6S129144	68k
R25	6S129145	82k
R26	6S129668	10k ±5%
R27	6S124A97	100k ±5%
R28	6S124B16	560k ±5%
R29	6S129225	10k
R30	6S129667	22k ±5%
R31	6S129668	10k ±5%

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R202	6S129146	150k
R203	6S128685	22k
R204	6S128685	22k
R205	6S127807	33k
R206	6S129779	560 ±5%
R207	6S129779	560 ±5%
R208	6S129225	10k
R209	6S129225	10k
R210	6S128687	6.8k
R211	6S128685	22k
R212	6S128685	22k
R213	6S131276	150 ±5%
R214	6S129886	27k ±5%
R215	6S129887	12k ±5%
R216	6S129681	1.5k ±5%
R217	6S128599	680 ±5%; 1/2 W
R218	6S129820	1.8k ±5%
R219	6S129805	1k ±5%; 1/2 W
S1	40D83303G05	SWITCH, lever; open-leaf type: 2 form "C"; 2-position, locking
S2	40C84342C01	SWITCH, rotary; 2-section; each section independently-controlled: consists of: front section; 1- pole, 4 position non-shorting rear section; 1-pole, 4 position non-shorting
S2A		
S2B		

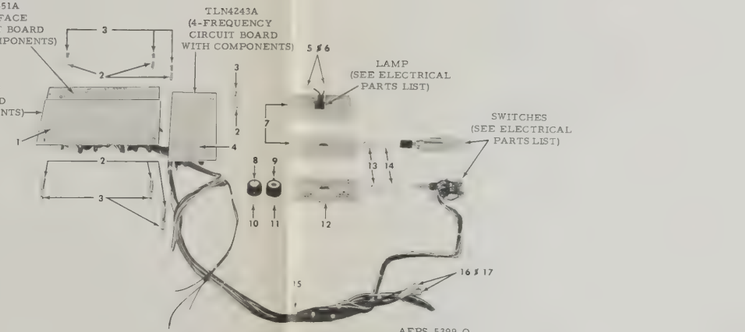
NOTE:

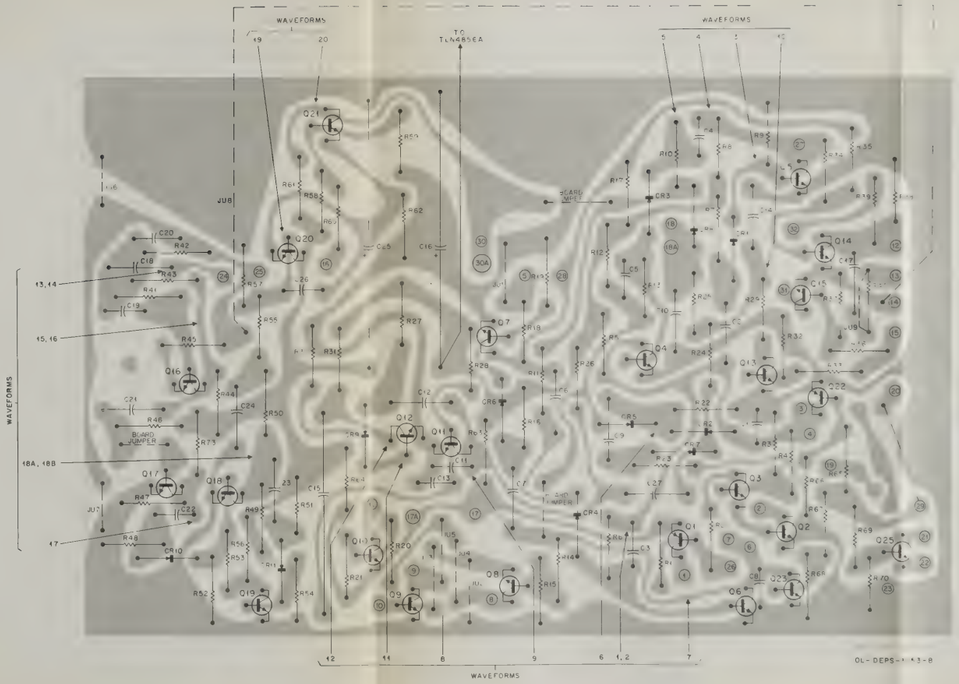
Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

PARTS LIST

TLN1372A "Channel-Scan" Kit MECHANICAL PARTS PL-1279-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	14B84264C01	INSULATOR, circuit board
2	43A84115C03	STUD, threaded
3	3S125790	SCREW, machine; 4-40 x 5/16" plain hex head (ext. lockw.)
4	14B84262C01	INSULATOR, circuit board
5	14C83799G02	INSULATOR, connector; female
6	39C83797G01	TERMINAL, connector contact; male; (used inside Item 5)
7	64D83071G07	PANEL INSERT
8	36C82628H09	KNOB, control; ("RCVR PRIORITY") includes Item 10
9	36A84356C01	KNOB, control; pointer type; ("XMTR FREQ")
10	3S7117	SETSCREW; 6-32 x 3/16" headless; slotted drive; (supplied with Item 8)
11	3S7104	SETSCREW; 8-32 x 3/16" headless; slotted drive; (supplied with Item 9)
12	64D84299C04	PANEL INSERT, switch mounting
13	2S8382	NUT, machine; 15/32-32 x 9/16" hex
14	4S8424	LOCKWASHER, 15/32" internal ty
15	42S10217A02	S[illegible]AP, cable harness
16	14C83799G01	INSULATOR, connector; male
17	39C83798G01	TERMINAL, connector contact; female; (used inside Item 16)


TLN4451A (INTERFACE CIRCUIT BOARD WITH COMPONENTS)
TLN4243A (4-FREQUENCY CIRCUIT BOARD WITH COMPONENTS)
TLN4242A (2-FREQUENCY CIRCUIT BOARD WITH COMPONENTS)
LAMP (SEE ELECTRICAL PARTS LIST)
SWITCHES (SEE ELECTRICAL PARTS LIST)
AEPS-5399-O



EARLIER VERSION

TLN1372A

"CHANNEL SCAN" MONITOR

TLN4242A-2 Two-Frequency Board
Circuit Board Detail
Motorola No. PEPS-4522-C
6/22/73-UP

TES:

THE FOLLOWING COMBINATION OF JUMPERS IS USED ON THIS BOARD.

IN	OUT
JU1	
JU2	
JU5	JU3
JU6	JU4
JU7	

ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS UNLESS OTHERWISE NOTED. pF = PICOFARADS.
ALL RESISTOR VALUES ARE GIVEN IN OHMS UNLESS OTHERWISE NOTED. K = KILOHMS.
ALL VOLTAGE MEASUREMENTS ARE IN RELATION TO CHASSIS GROUND WITH +13.8 V DC APPLIED TO THE RADIO SET AND THE SQUELCH CONTROL SET AT THRESHOLD. SCAN SWITCH IN THE "SCAN" POSITION.

—— v	= UNIT SCANNING - NO RF CARRIERS PRESENT
—— v	= UNIT RECEIVING A NON-PRIORITY CHANNEL
—— v	= UNIT RECEIVING A PRIORITY CHANNEL

VOLTAGE AT THIS POINT VARIES WITH MODEL AND INSTALLATION OPTION USED.

R —— v	= VOLTAGE IN RECEIVE MODE
T —— v	= VOLTAGE IN TRANSMIT MODE

VOLTAGES SHOWN ARE FOR TRANSMIT MODE ONLY. REFER TO VOLTAGES ON COLLECTORS OF Q4 AND Q6 FOR RECEIVE MODE.
RESISTOR R213 MUST BE REMOVED WHEN INTERFACE BOARD IS USED WITH CARRIER SQUELCH STATIONS.

EPS-4525-A

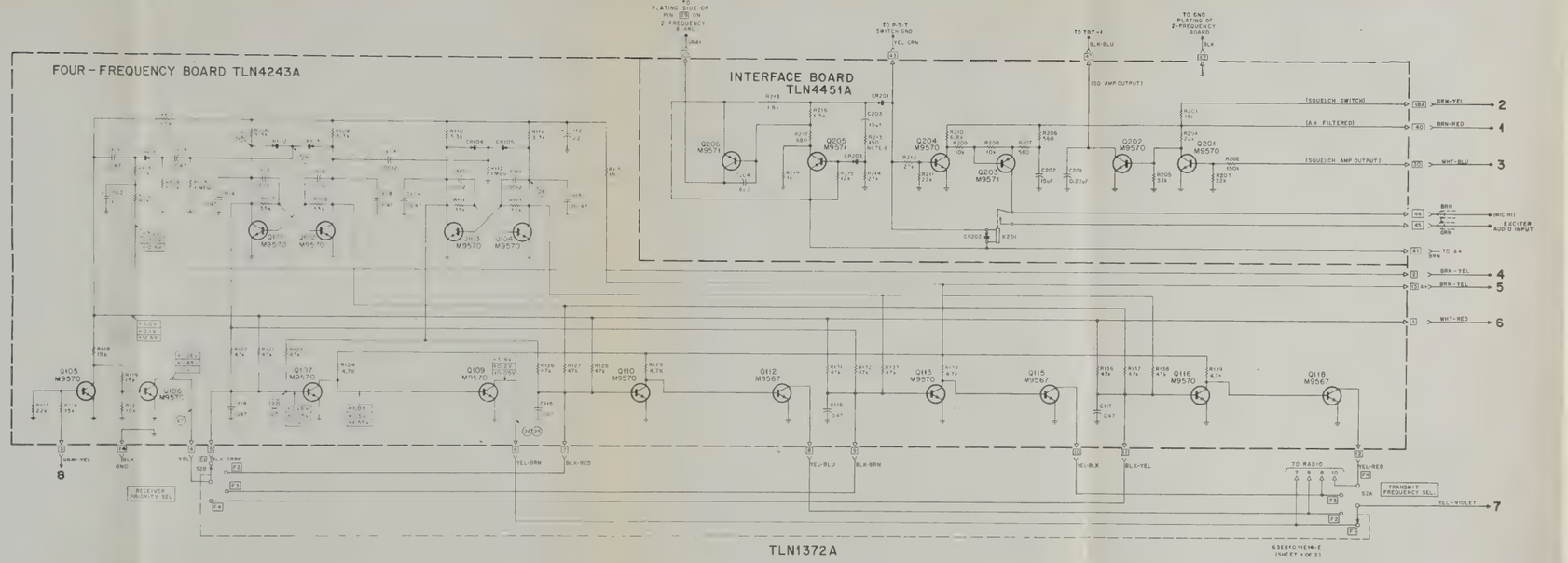
EARLIER VERSION

TLN1372A

"CHANNEL-SCAN" MONITOR

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

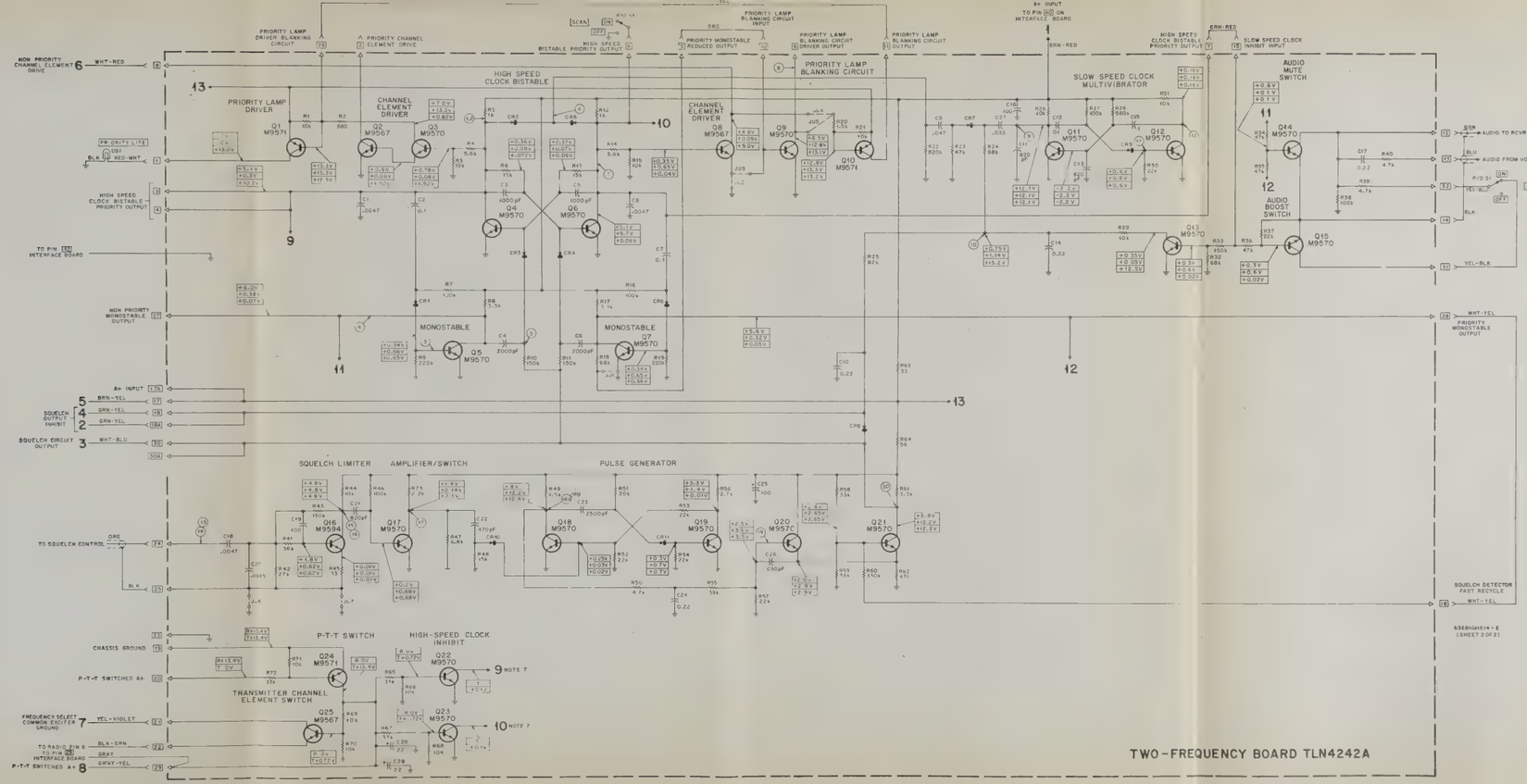
"Channel-Scan" Monitor
Schematic Diagram
Motorola No. 63E81011E14-E
(Sheet 2 of 2)
6/22/73-UP



EARLIER VERSION
TLN1372A

"Channel-Scan" Monitor
Schematic Diagram
Motorola No. 63E81011E14-E
(Sheet 1 of 2)
6/22/73-UP

In



NOTES:

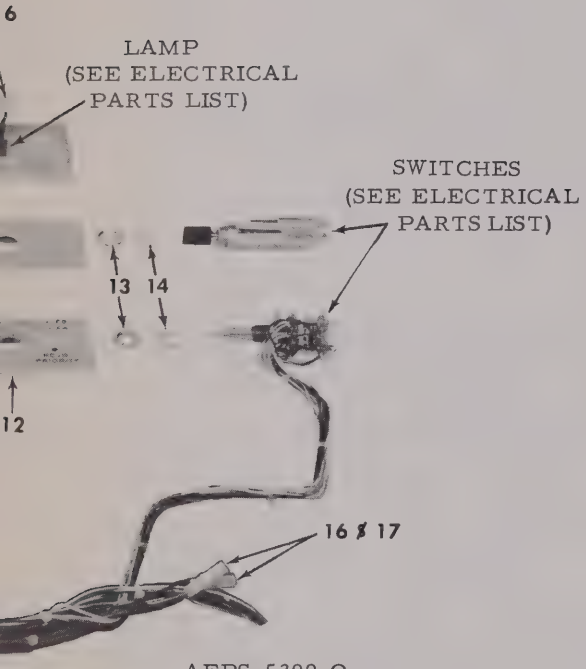
1. THE FOLLOWING COMBINATION OF JUMPERS IS USE
2. ALL CAPACITOR VALUES ARE GIVEN IN MICROFARAD
   UNLESS OTHERWISE NOTED. pf - PICOFARADS.
3. ALL RESISTOR VALUES ARE GIVEN IN OHMS UNLE
   OTHERWISE NOTED. K = KILOHMS.
4. ALL VOLTAGE MEASUREMENTS ARE IN RELATION TO
   CHASSIS GROUND WITH +13.8 VDC APPLIED TO THE PADS
   "C" AND THE SQUELCH CONTROL SET AT THRESHOLD,
   SCAN SWITCH IN THE "SCAN" POSITION.
   - UNIT SCANNING - NO RF CARRIER
   - UNIT RECEIVING A PRIORITY CHANNEL
5. VOLTAGE AT THIS POINT VARIES WITH MODEL AND INSTA
6. - VOLTAGE IN TRANSMIT MODE
7. OR R211 MUST BE REMOVED
   WITH CAPABLE SQUELCHES.

EARLIER VERSION

TLN1372A

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

"Channel-Scan" Monitor
Schematic Diagram
Motorola No. 63E81011E14-E
(Sheet 2 of 2)
6/22/73-UP

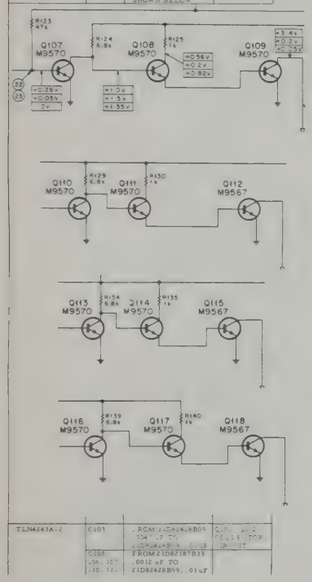

6
LAMP
(SEE ELECTRICAL
PARTS LIST)
SWITCHES
(SEE ELECTRICAL
PARTS LIST)
13
14
12
16 & 17

AEPS-5399-O

REVISIONS

61E81011E14-E

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
TLN4262A-1 & 2	R89	FROM 6S127803, 6.5k TO 6S129225, 10k	Q25 BASE	TWO-FREQ. BD PEPS-4522-A
	R89, 29	ADDED 28D32314C07, 22 uF		
TLN4243A-1	Q103, 111, 114, 117	REMOVED 48R869570	Q108, Q111, Q114, Q117	FOUR-FREQ BD PEPS-4523-B
	R125, 130, 135, 140	REMOVED 6S127802, 1k		
	R124, 129, 134, 139	FROM 6S128687, 6.8k TO 6S127804, 4.7k		
		CIRCUIT WAS AS SHOWN BELOW		



TLN4243A-2 C101 ... R140 ... Q118 ... PEPS-4523-B

C102 ... FROM 21D82187B33 .001 uF TO 21D82428B59, .01 uF

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION

PARTS LIST

TLN1372A "Channel-Scan" Monitor PL-1287-A

		CAPACITOR, fixed: uF ±10%, unl. stated
C1	21D82428B09	.0047, 100 V
C2	8K863306	1.0, 100 V
C3	21D82537B16	1000 pF ±5%, 100 V
C4	21K859948	2000 pF ±5%, 500 V
C5	21D82537B11	1000 pF ±5%, 100 V
C6	21K859948	2000 pF ±5%, 500 V
C7	8D82905G07	0.1, 50 V
C8	21D82428B07	.0047, 100 V
C9	8D82905G03	.047, 50 V
C10	8D82905G11	0.22, 50 V
C11	21D82187B21	820 pF, 200 V
C12	8D82905G07	0.1, 50 V
C13	21D82187B21	820 pF, 200 V
C14	8D82905G11	0.22, 50 V
C15	8K863306	1.0, 100 V
C16	23D83210A05	100 +150-10%, 25 V
C17	8D82905G11	0.22, 50 V
C18	8D82905G26	.0047, 100 V
C19	21K850118	100 pF ±5%, 100 V
C20	21D82187B15	1500 pF, 100 V
C21	21K873269	820 pF ±2%, 300 V
C22	21D82537B06	470 pF ±5%, 300 V
C23	21K863296	2500 pF ±2%, 500 V
C24	8D82905G11	0.22, 50 V
C25	23D83210A05	100 +150-10%, 25 V
C26	21K848236	650 pF ±5%, 300 V
C27	8D82905G08	.033, 25 V
C28	23D83214C05	22 ±20%, 15 V
C29	23D83214C07	22 ±20%, 15 V
C30	21D82428B07	.0047, 100 V
C31	23D83214C04	1.0 ±20%, 15 V
C32	21D82428B59	.01 +80-20%, 200 V
C33	21D82428B07	.0047, 100 V
C34	21D82428B59	.01 +80-20%, 200 V
C35	21D82428B59	.01 +80-20%, 200 V
C36	21D82428B59	.01 +80-20%, 200 V
C37	21D82428B07	.0047, 100 V
C38	21D82428B09	.0047, 100 V
C39	21D82428B59	.01 +80-20%, 200 V
C40	21D82428B59	.01 +80-20%, 200 V
C41	23D83214C07	22 ±20%, 15 V
C42	21D82428B07	.0047, 100 V
C43	8D82905G03	.047, 50 V
C44	8D82905G03	.047, 50 V
C45	8D82905G03	.047, 50 V
C46	8D82905G03	.047, 50 V
C47	8D82905G11	0.22, 50 V
C48	23D83214C02	15 ±20%, 25 V
C49	23D83214C16	15 +5-.20 V
C50	21D82187B21	820 pF ±10%, 200 V
		SEMICONDUCTOR DEVICE, diode (SEE NOTE)
CR1	48D82392B01	silicon
CR2	48D82392B01	silicon
CR3	48D82492B01	silicon
CR4	48D82392B01	silicon
CR5	48D82392B01	silicon
CR6	48D82392B01	silicon
CR7	48D82392B01	silicon
CR8	48D82392B01	silicon
CR9	48D82392B01	silicon
CR10	48D82392B01	silicon
CR11	48D82392B01	silicon
CR12	48D82392B01	silicon
CR13	48D82392B01	silicon
CR14	48D82392B01	silicon
CR15	48D82392B01	silicon
CR16	48D82392B01	silicon
CR17	48D82392B01	silicon
CR18	48D82392B01	silicon
CR19	48D82392B01	silicon
CR20	48D82392B01	silicon
CR21	48D82392B01	silicon
CR22	48D82392B01	silicon
CR23	48D82392B01	silicon
CR24	48D82392B01	silicon
CR25	48D82392B01	silicon
DS1	6S83411C01	LIGHT, indicator; 14 V; .08 A; includes AMBER lens, connecting leads and mounting hardware; does not include 4A84121C01 WASHER, mounting
K201	80D84157B01	RELAY, magnetic reed; 13.4 V dc; 1 form "A" coil res 820 ohms ±10%

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		TRANSISTOR (SEE NOTE)
Q1	48R869571	P-N-P; type M9571
Q2	48R869567	N-P-N; type M9567
Q3	48R869570	N-P-N; type M9570
Q4	48R869570	N-P-N; type M9570
Q5	48R869570	N-P-N; type M9570
Q6	48R869570	N-P-N; type M9570
Q7	48R869570	N-P-N; type M9570
Q8	48R869567	N-P-N; type M9567
Q9	48R869570	N-P-N; type M9570
Q10	48R869571	P-N-P; type M9571
Q11	48R869570	N-P-N; type M9570
Q12	48R869570	N-P-N; type M9570
Q13	48R869570	N-P-N; type M9570
Q14	48R869570	N-P-N; type M9570
Q15	48R869570	N-P-N; type M9570
Q16	48R869594	N-P-N; type M9594
Q17	48R869570	N-P-N; type M9570
Q18	48R869570	N-P-N; type M9570
Q19	48R869570	N-P-N; type M9570
Q20	48R869570	N-P-N; type M9570
Q21	48R869570	N-P-N; type M9570
Q22	48R869570	N-P-N; type M9570
Q23	48R869570	N-P-N; type M9570
Q24	48R869571	P-N-P; type M9571
Q25	48R869567	N-P-N; type M9567
Q101	48R869570	N-P-N; type M9570
Q102	48R869570	N-P-N; type M9570
Q103	48R869570	N-P-N; type M9570
Q104	48R869570	N-P-N; type M9570
Q105	48R869570	N-P-N; type M9570
Q106	48R869570	N-P-N; type M9570
Q107	48R869570	N-P-N; type M9570
Q109	48R869567	N-P-N; type M9567
Q110	48R869570	N-P-N; type M9570
Q112	48R869567	N-P-N; type M9567
Q113	48R869570	N-P-N; type M9570
Q115	48R869567	N-P-N; type M9567
Q116	48R869570	N-P-N; type M9570
Q118	48R869567	N-P-N; type M9567
Q701	48R869570	N-P-N; type M9570
Q202	48R869570	N-P-N; type M9570
Q203	48R869571	P-N-P; type M9571
Q204	48R869570	N-P-N; type M9570
Q205	48R869571	P-N-P; type M9571
Q206	48R869571	P-N-P; type M9571
		RESISTOR, fixed: ±10%; 1/4 W unl. stated
R1	6S129225	10k
R2	6S128399	470
R3	6S129225	10k
R4	6S129433	5.6k
R5	6S129805	1k ±5%
R6	6S129236	15k ±5%
R7	6S124A97	100k ±5%
R8	6S129981	3.3k ±5%
R9	6S129147	220k
R10	6S128683	150k ±5%
R11	6S128683	150k ±5%
R12	6S129805	1k ±5%
R13	6S129236	15k ±5%
R14	6S129433	5.6k
R15	6S129225	10k
R16	6S124A97	100k ±5%
R17	6S129981	3.3k ±5%
R18	6S129144	68k
R19	6S129147	220k
R20	6S127803	1.5k
R21	6S129225	10k
R22	6S129012	820k
R23	6S128902	47k
R24	6S129144	68k
R25	6S129145	82k
R26	6S129668	10k ±5%
R27	6S124A97	100k ±5%
R28	6S124B16	560k ±5%
R29	6S129225	10k
R30	6S129667	22k ±5%
R31	6S129668	10k ±5%

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R32	6S129144	68k
R33	6S129146	150k
R34	6S131527	47k ±5%
R35	6S131527	47k ±5%
R36	6S128902	47k
R37	6S128685	22k
R38	6S129226	100k
R39	6S127804	4.7k
R40	6S127804	4.7k
R41	6S128684	56k ±5%
R42	6S127806	27k
R43	6S126683	150k ±5%
R44	6S129668	10k ±5%
R45	6S129754	33
R46	6S124A97	100k ±5%
R47	6S128687	6.8k
R48	6S127805	15k
R49	6S129681	1.5k ±5%
R50	6S129669	4.7k ±5%
R51	6S124A84	30k ±5%
R52	6S129667	22k ±5%
R53	6S129667	22k ±5%
R54	6S129667	22k ±5%
R55	6S129777	39k ±5%
R56	6S129707	2.7k ±5%
R57	6S129667	22k ±5%
R58	6S129526	33k ±5%
R59	6S129668	10k ±5%
R60	6S129473	330k ±5%
R61	6S129981	3.3k ±5%
R62	6S129709	470 ±5%
R63	6S129754	33
R64	6S129809	56
R65	6S127807	33k
R66	6S129225	10k
R67	6S127807	33k
R68	6S129225	10k
R69	6S129225	10k
R70	6S129225	10k
R71	6S129225	10k
R72	6S127807	33k
R73	6S129604	2.2k ±5%
R101	6S127803	1.5k
R102	6S128902	47k
R103	6S128902	47k
R104	6S129226	100k
R105	6S129013	1 meg
R106	6S129981	3.3k ±5%
R107	6S129526	33k ±5%
R108	6S129526	33k ±5%
R109	6S129981	3.3k ±5%
R110	6S129981	3.3k ±5%
R111	6S129526	33k ±5%
R112	6S129013	1 meg
R113	6S129526	33k ±5%
R114	6S129981	3.3k ±5%
R115	6S129862	150
R116	6S127805	15k
R117	6S128685	22k
R118	6S127805	15k
R119	6S127805	15k
R120	6S129225	10k
R121	6S131527	47k ±5%
R122	6S131527	47k ±5%
R123	6S131527	47k ±5%
R124	6S127804	4.7k
R125	6S131527	47k ±5%
R126	6S131527	47k ±5%
R128	6S131527	47k ±5%
R129	6S127804	4.7k
R131	6S131527	47k ±5%
R132	6S131527	47k ±5%
R133	6S131527	47k ±5%
R134	6S127804	4.7k
R136	6S131527	47k ±5%
R137	6S131527	47k ±5%
R138	6S131527	47k ±5%
R139	6S127804	4.7k
R201	6S128904	18k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R202	6S129146	150k
R203	6S128685	22k
R204	6S128685	22k
R205	6S127807	33k
R206	6S129779	560 ±5%
R207	6S129779	560 ±5%
R208	6S129225	10k
R209	6S129225	10k
R210	6S128687	6.8k
R211	6S128685	22k
R212	6S128685	22k
R213	6S131276	15D ±5%
R214	6S129886	27k ±5%
R215	6S129887	12k ±5%
R216	6S129681	1.5k ±5%
R217	6S128599	680 ±5%; 1/2 W
R218	6S129820	1.8k ±5%
R219	6S129805	1k ±5%; 1/2 W
S1	40D83303G05	SWITCH, lever; open-leaf type; 2 form "C"; 2-position, locking
S2	40C84342C01	SWITCH, rotary; 2-section; each section independently-controlled; consists of:
S2A		front section; 1-pole, 4 position non-shorting
S2B		rear section; 1-pole, 4 position non-shorting

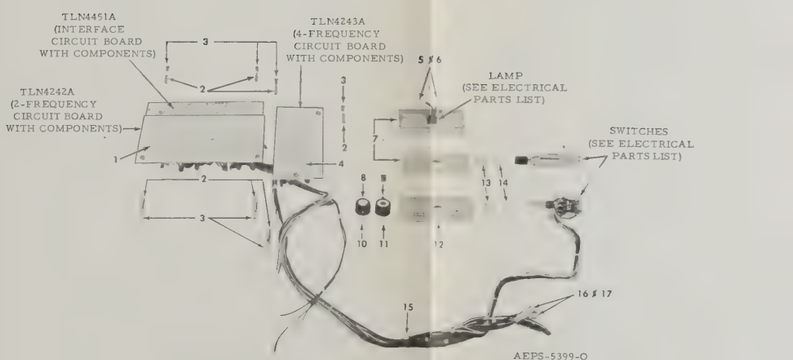
NOTE

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

PARTS LIST

TLN1372A "Channel-Scan" Kit MECHANICAL PARTS PL-1279-O

CODE	MOTOROLA PART NO.	DESCRIPTION
1	14B84266C01	INSULATOR, circuit board
2	43A84115C03	STUD, threaded
3	3S125790	SCREW, machine; 4-40 x 5/16" plain hex head (ext. lockw.)
4	14B84262C01	INSULATOR, circuit board
5	14C83799G02	INSULATOR, connector, female
6	39C83797G01	TERMINAL, connector contact; male; (used inside Item 5)
7	64D83071G07	PANEL INSERT
8	36C82628H09	KNOB, control; ("RCVR PRIORITY") includes Item 10
9	36A84356C01	KNOB, control; pointer type; ("XMTR FREQ")
10	3S7117	SETSCREW, 6-32 x 3/16" headless; slotted drive, (supplied with Item 8)
11	3S7104	SETSCREW, 8-32 x 3/16" headless; slotted drive; (supplied with Item 9)
12	64D84299C04	PANEL INSERT, switch mounting
13	2S8382	NUT, machine; 15/32-32 x 9/16" hex
14	4S8424	LOCKWASHER; 15/32" internal type
15	42S10217A02	STRAP, cable harness
16	14C83799C01	INSULATOR, connector; male
17	39C83798G01	TERMINAL, connector contact; female; (used inside Item 16)



EMERGENCY POWER REVERTING KIT

MODEL TLN1374A

AEPS-8464-O

1. DESCRIPTION

This unit is for use with a solid-state "Consolette" Base Station. It automatically switches the station to a 12-volt dc standby power source in the event of a 120-volt ac primary power source failure. A warning light provides a visual indication of standby power usage by causing the green "power on" lamp on the station to flash while on standby power.

The station automatically reverts back to the 120-volt ac primary power source and the "power on" lamp returns to steady operation when primary power is restored.

A "trickle" charging circuit maintains a normally charged battery at full capacity for extended periods of time. However, lead-antimony batteries must be removed and equalized (charged) periodically as determined by the battery type and operating conditions.

2. THEORY OF OPERATION

Operation from primary or standby power is controlled by transistor Q651 which is connected as a diode. The transistor "monitors" the power supply output voltage at J201-M1 and -R1. While +13.5 volts dc is present at these pins, Q651 is

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reverse biased and resistor R651 limits the charging current to the standby battery. When ac power is lost, +13.5 volts dc is removed from J201-M1 and -R1, and Q651 becomes forward biased causing standby battery power to be routed to the station.

The station "power on" lamp flashing is controlled by the warning light circuit board. This circuit consists of an astable multivibrator, Q601 and Q603, a lamp driver transistor Q604, and an ac sense amplifier Q602. Primary ac power to the station is rectified by power supply bridge diode CR201 resulting in positive pulses at a 60-Hz rate. These pulses are routed to the warning light circuit board. The rate of the pulses is sufficient to forward bias transistor Q602 which, in turn, applies a ground potential to the anode of diode CR603. The ground on the anode of CR603 removes the base drive from Q603 which results in a positive potential at its collector. This voltage forward biases Q604 which presents a ground potential to the "power on" lamp and turns it on. A+ is applied to the lamp continuously while the station is turned "on".

During a power failure, the anode of CR603 is not "tied" to ground through Q602 since the lack of input pulses prevent Q602 from turning on. While Q602 is off, astable transistors Q603 and Q601 turn on and off alternately. This causes Q604 to turn on and off alternately, presenting an interrupted switched ground to the "power on" lamp which causes it to flash.

3. INSTALLATION

a. General

Locate the battery (or batteries) in a secure place, as close to the station as possible (battery cables should be kept as short as possible). The location must be adequately ventilated to provide unobstructed air circulation and should be fully accessible for inspection and maintenance. The battery must not be placed near radiators, boilers, or other heat-producing devices, or in direct sunlight.

b. Revert Plug Installation

(1) Turn off the base station power.

(2) Unplug the base station from the power source.

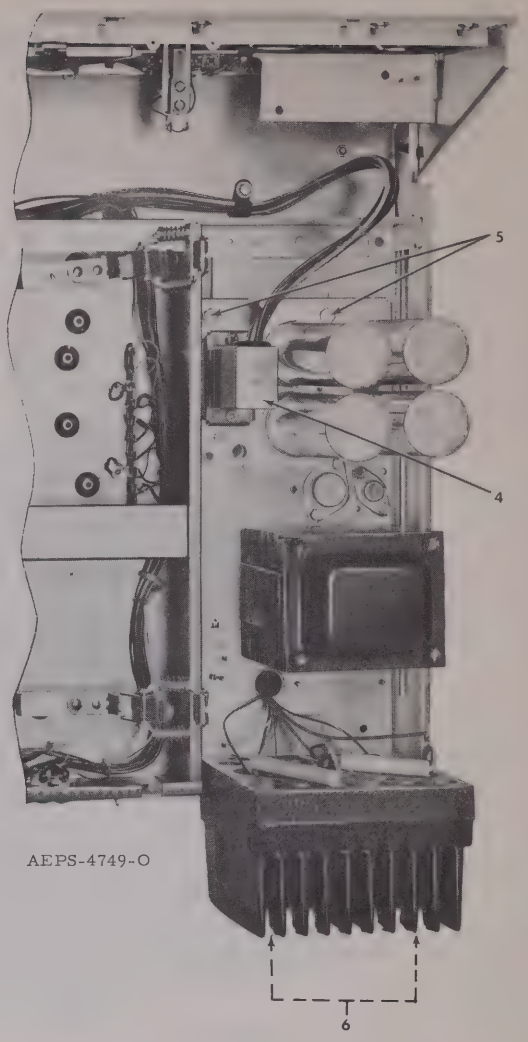


Figure 1.

(3) Remove the base station cabinet.

(4) Disconnect the 15-pin power cable plug from the power supply (item 4 in Figure 1).

(5) Remove the screws indicated by item 5 in Figure 1.

(6) Remove two screws at the back of the power supply below the heat sink (item 6 in Figure 1).

(7) Lift the power supply chassis (with ac line cord attached) straight up and away from the base station chassis.

(8) Connect the emergency reverting kit to the power supply (item 8 in Figure 2).

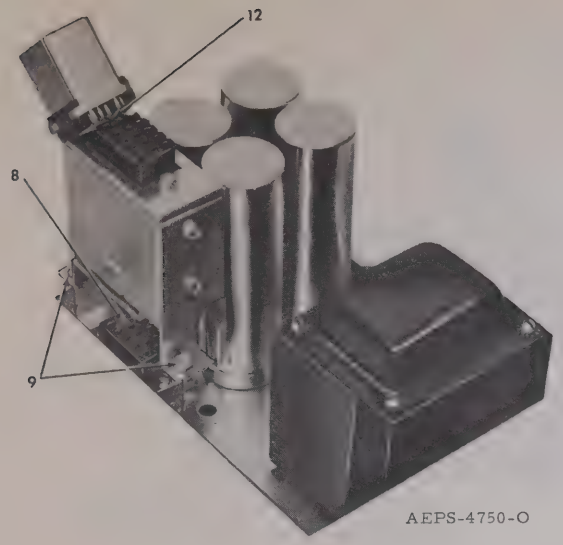


Figure 2.

(9) Tighten screws (item 9 in Figure 2).

(10) Route the RED and BLK leads underneath the power supply as illustrated in Figure 3.

(11) Reinstall the power supply in the base station.

(12) Connect the 15-pin power cable plug to the emergency reverting kit as indicated at item 12 in Figure 2.

(13) Connect the RED lead to battery (+) and the BLK lead to battery (-).

c. Warning Light Circuit Board Installation

(1) Attach the metal bracket to the base station front panel with screws provided as indicated at item 1 in Figure 5.

(2) Attach the warning light circuit board to the metal bracket with screws provided as indicated at item 2 in Figure 5.

(3) Connect the BLK lead to ground at TB4-8 as shown in Figure 4.

(4) Connect the RED-WHT lead to TB8-1 as shown in Figure 4.

(5) Connect the BRN-YEL lead to the RED transmit indicator lamp socket as shown in Figure 4. Two BRN-YEL leads will not connect to this point.

(6) Remove the bare jumper on the green "power on" indicator lamp socket. This removes ground from the lamp.

(7) Connect the bare end of the BLK lead with the push-on pin to the ground terminal of the "power on" lamp socket as shown in Figure 4. Connect connector end of this lead to the warning light circuit board.

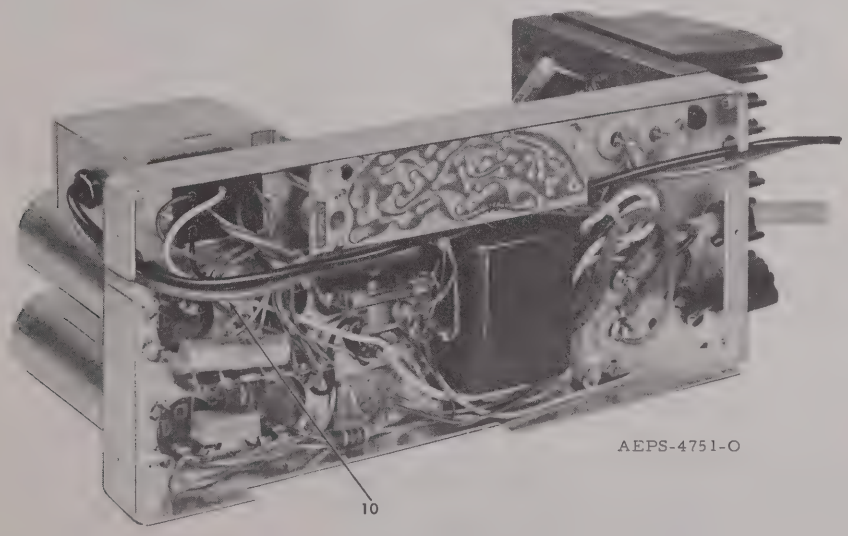


Figure 3.

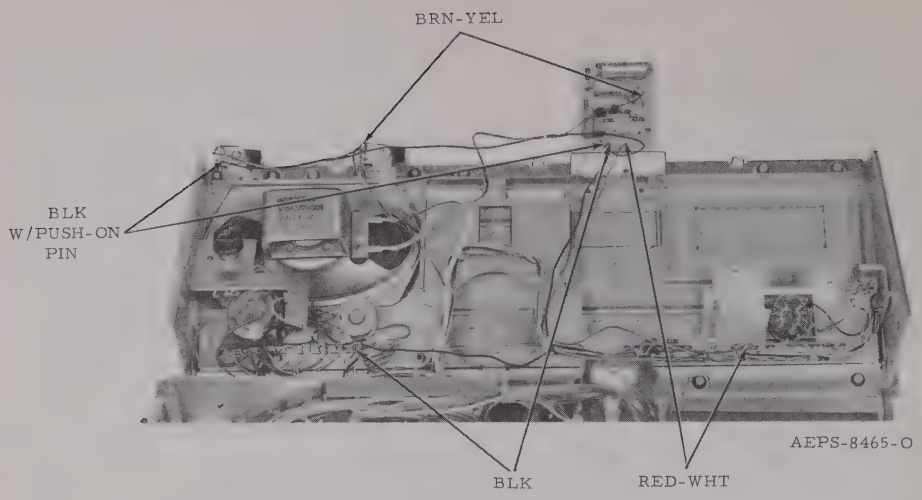


Figure 4.

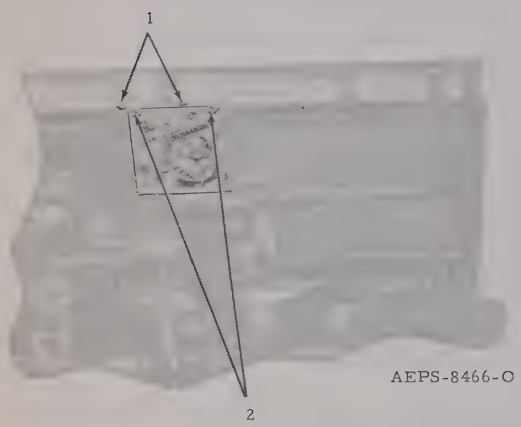


Figure 5.

4. GENERAL BATTERY INFORMATION

a. Battery Type Considerations

Different types of batteries exhibit different characteristics and each type varies in performance in relation to such operating conditions as temperature, amount of use, age, etc. A brief comparison between the two battery types recommended for use with the emergency power reverting kit is given in Table 1.

Automotive batteries are not designed for continuous standby service. They require frequent use, discharge and charge cycling, to maintain top efficiency. However, economics or availability may dictate their use over the stationary call type.

b. Battery Capacity Considerations

Battery capacity, or size, needed for use with the solid-state "Consolette" Base Station is dictated primarily by the power requirements of the station itself, the length of time power will be required, and the temperature of the battery while being used.

Assuming the receive or standby mode draws 1 ampere and the transmit mode draws 14 amperes, the 20% transmit duty cycle of the station means

Table 1.

CHARACTERISTIC	BATTERY TYPE (STATIONARY CELLS)	
	LEAD - CALCUIM	LEAD - ANTIMONY
LIFE EXPECTANCY	10-15 YEARS	2-5 YEARS
STANDBY PERFORMANCE	GOOD	POOR
ADD ELECTROLYTE (WATER)	EVERY 6 MONTHS	MONTHLY
EQUALIZE	EVERY 3 MONTHS	MONTHLY

that an 18 ampere-hour capacity battery is required for each five hours of operation at room temperature (77°F). Ten hours of emergency operation would therefore require at least a 36 ampere-hour battery if it was fully charged initially and the battery ambient temperature remained above 77°F while in use. Lead-calcium and lead-antimony battery performance degradation is shown in Table 2.

CAUTION

Care must be exercised below 0°F to prevent discharged batteries from freezing.

Table 2.

TEMPERATURE	CAPACITY
77°F	100%
32°F	72%
0°F	47%

5. MAINTENANCE

a. Routine Maintenance

The battery or batteries used for emergency power require certain routine maintenance procecures to assure long trouble-free operation. Persons servicing the batteries should refer to the manufacturer's recommendations for routine maintenance. In addition, certain maintenance procedures are appropriate following each interval of emergency power operation, especially if the battery has been completely discharged.

CAUTION

The battery or batteries must be disconnected from the station while being charged.

The importance of keeping good battery maintenance records cannot be over-emphasized. The battery status chart following this maintenance information allows the listing of cell voltage readings, temperature and hydrometer readings (where applicable), versus the dates on which the readings were taken. To be most effective, the battery status chart should be kept at the battery location for ready reference.

b. Lead Acid Batteries

Perform the routine maintenance procedures monthly.

(1) Clean the battery and inspect it for damage.

(2) Measure cell voltages and enter the voltage readings on your maintenance report. Most maintenance schedules require voltage readings of every cell each time maintenance is performed. If a difference of .05 volt or more exists between any two cells, apply an "equalizing charge" to the battery for the number of hours recommended by the manufacturer for a terminal voltage of 13.5 volts.

(3) Take specific gravity readings with a hydrometer calibrated for the type of electrolyte used.

(a) Observe the necessary precautions to see that the readings are accurate, that no chemical contamination of the cells occurs, and to prevent bodily injury from contact with the electrolyte.

(b) After taking a reading, always return the electrolyte in the hydrometer syringe to the cell from which it came. (Failure to do so will decrease the specific gravity of the cell when water is added to fill up the cell.)

(c) For an accurate comparison with "standard" specific gravity readings, as published in manufacturer's specifications, a correction factor must be applied to all readings to normalize them with the standard values, when taken at temperatures other than 77°Fahrenheit. However, if the battery temperature tends to be the same each time specific gravity readings are taken, a trend toward a change in specific gravity will be apparent without having to apply the correction factor to the readings.

The correction factor is easily applied, due to a linear relationship between changes in temperature and specific gravity above and below 77°F. For each three degrees above 77°F, add .001 (known as "1 point") to the "standard" value of specific gravity. Conversely, for each three degrees below 77°F, subtract 1 point.

(d) Take a specific gravity reading of the "pilot cell" monthly. It is not necessary to continually check the specific gravity of all cells, because any gradual changes usually occur simultaneously in all cells. One cell is therefore chosen and designated the "pilot cell", and the monthly routine specific gravity readings are always taken

from this one cell. (Be sure to indicate on the maintenance chart which cell is the pilot cell.)

Take specific gravity readings of all the battery cells every three months, and record them on the maintenance chart.

(4) Add water as required to keep the electrolyte solution in each cell up to a minimum level. In some batteries, the electrolyte level should be between the high- and low-level marks on the inside of each cell. If the cells have no such markers, check the manufacturer's literature. Use distilled water only.

NOTE

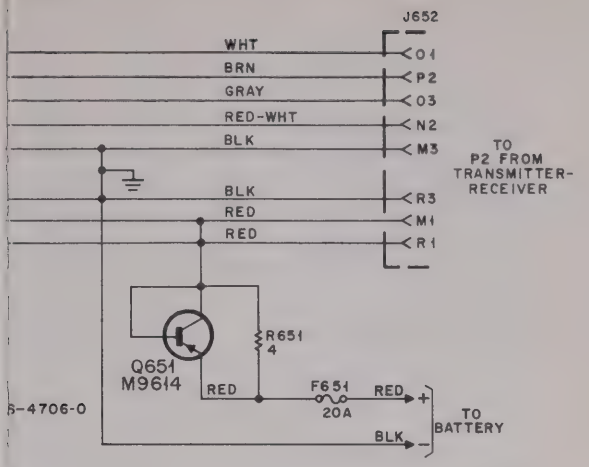
Do not use any tool on a lead-acid battery which may have been used with nickel-cadmium batteries. To do so may destroy the lead-acid battery, due to chemical contamination by electrolyte or other foreign matter from the nickel-cadmium battery existing on the surface of the tool in question.

c. Cable Connections

Cable connections to the emergency power equipment must be clean and firmly made at all times. Tighten all bolted connections yearly. Clean and remake any corroded connections.

BATTERY STATUS CHART

DATE	TEMPERATURE	CELL VOLTAGE						CELL SPECIFIC GRAVITY (TEMPERATURE CORRECTED) MANUFACTURER'S STANDARD IS_____					
		1	2	3	4	5	6	(PILOT) 1	2	3	4	5	6



	SUFFIX	SUB-MODEL	SUFFIX	DESCRIPTION
		TLN4431A		REVERT PLUG KIT
		TLN4482A	1	WARNING LIGHT KIT

EPS-4747-B

EMERGENCY POWER REVERTING KIT

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

Emergency Power Reverting Kit
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81011E23-B
2/7/73-UP

from this one cell. (Be sure to indicate on the maintenance chart which cell is the pilot cell.)

Take specific gravity readings of all the battery cells every three months, and record them on the maintenance chart.

(4) Add water as required to keep the electrolyte solution in each cell up to a minimum level. In some batteries, the electrolyte level should be between the high- and low-level marks on the inside of each cell. If the cells have no such markers, check the manufacturer's literature. Use distilled water only.

NOTE

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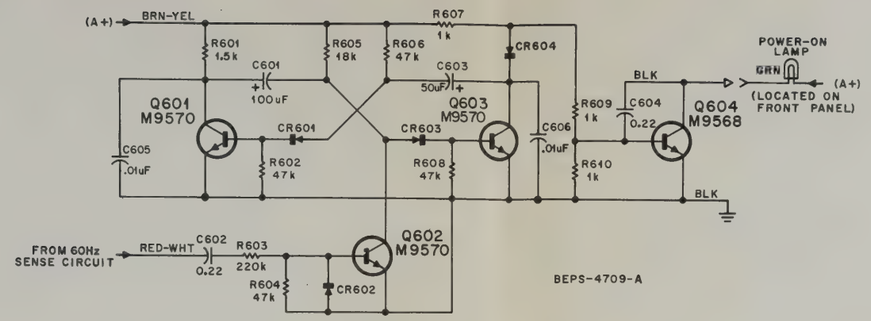
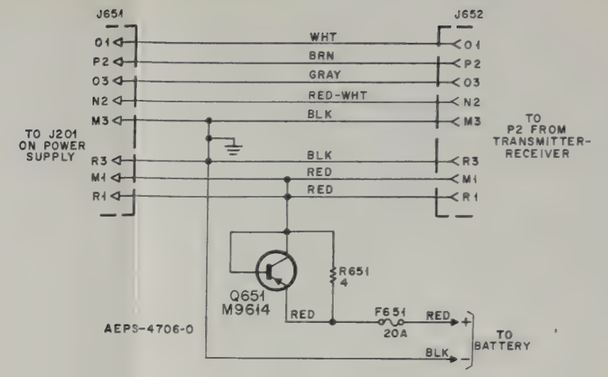
BATTERY STATUS CHART

DATE	TEMPERATURE	CELL VOLTAGE						CELL SPECIFIC GRAVITY (TEMPERATURE CORRECTED) MANUFACTURER'S STANDARD IS_____					
		1	2	3	4	5	6	(PILOT) 1	2	3	4	5	6



BEPS-4709-A



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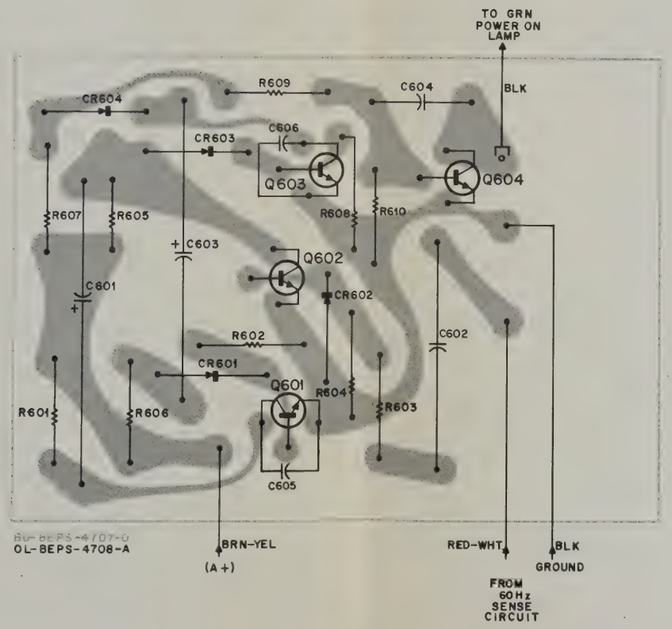


OL-BEPS-4708-A

MODEL	SUFFIX	SUB-MODEL	SUFFIX	DESCRIPTION
TLN1374A		TLN4431A		REVERT PLUG KIT
		TLN4482A	1	WARNING LIGHT KIT

EPS-4747-B

EMERGENCY POWER REVERTING KIT

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Emergency Power Reverting Kit
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81011E23-B
2/7/73-UP

E	MOTOROLA PART NO.	DESCRIPTION
'arning Light Kit		PL-1162-B
		CAPACITOR, fixed:
	23D82601A25	100 uF +150-10%; 20 V
	8K868594	0.22 uF ±10%; 100 V
	23D82601A05	50 uF +150-10%; 25 V
	8D82905G11	0.22 uF ±10%; 50 V
	21K832501	.01 uF +60-40%; 250 V
	21K832501	.01 uF +60-40%; 250 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
	48C82392B03	silicon
	48C82392B03	silicon
	48C82392B03	silicon
	48C82392B03	silicon
		TRANSISTOR: (SEE NOTE)
	48R869570	N-P-N; type M9570
	48R869570	N-P-N; type M9570
	48R869570	N-P-N; type M9570
	48R869568	N-P-N; type M9568
		RESISTOR, fixed: ±10%; 1/4 W;
	6S127803	1.5k
	6S128902	47k
	6S129147	220k
	6S128902	47k
	6S128904	18k
	6S128902	47k
	6S127802	1k
	6S128902	47k
	6S127802	1k
	6S127802	1k
NON-REFERENCED ITEM		
	TLN4482A	PRINTED CIRCUIT BOARD (complete)

cement diodes and transistors must be ordered by
:ola part number only for optimum performance.

REVISIONS

63P81011E23-B

BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
TLN1374A (TLN4482A-1)	C605, 606	ADDED .01 uF	Q601, 603

PARTS LIST

TLN4431A Revert Plug Kit (p/o TLN1374A) PL-1163-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F651	65S4637	FUSE, cartridge: 20 amp
J651		CONNECTOR, receptacle: incl. 14C82337A02 INSULATOR, plug: male; 29C82335A01 CONTACTS, plug: male
J652		incl. 14C83783A04 INSULATOR, connector: female; 29C82336A01 CONTACTS, connector: female
Q651	48R869614	TRANSISTOR: (SEE NOTE) P-N-P; type M9614
R651	17D82177B03	RESISTOR, fixed: 4 ±10%; 5 W
XF651		FUSEHOLDER: consists of; 14A82882A01 BODY, fuseholder 14A82883A01 CAP, fuseholder 41A867068 SPRING, fuseholder 42A82884A01 CLIP, fuse: 2 used 29K832116 LUG, ring: 3/8" 2K824154 LUG, ring: #10
NON-REFERENCED ITEMS		
	7B84483C01	BRACKET, transistor mtg.
	4B82345A01	WASHER, shoulder (transistor)
	14K857437	INSULATOR, transistor (Mica)
	3S2294	LOCKSCREW: No. 6-32 x 1/2"
	3S122931	LOCKSCREW: No. 6-32 x 7/16"
	4S7650	LOCKWASHER: No. 6
	2S7005	NUT, hex: No. 6-32 x 1/4"
	29K845081	LUG, ring: #8
	7B84108C01	BRACKET, connector mtg.
	15B84111C01	COVER, housing
	64B84116C01	PLATE, connector retaining
	3S7302	SCREW, machine: No. 10-32 x 3/8"
	2S1359	NUT, hex: No. 10-32 x 3/8"
	4S7658	LOCKWASHER: No. 10 Int.
		MOUNTING KIT: includes; 64B84526C01 BRACKET, mtg.
	3S134121	SCREW, tapping: No. 4-40 x 5/16"; 4 used
	3S131965	SCREW, tapping: No. 8-32 x 3/8"

TLN4482A Warning Light Kit PL-1162-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C601	23D82601A25	CAPACITOR, fixed: 100 uF +150-10%; 20 V
C602	8K868594	0.22 uF ±10%; 100 V
C603	23D82601A05	50 uF +150-10%; 25 V
C604	8D82905G11	0.22 uF ±10%; 50 V
C605	21K832501	.01 uF +60-40%; 250 V
C606	21K832501	.01 uF +60-40%; 250 V
CR601	48C82392B03	SEMICONDUCTOR DEVICE, diode: (SEE NOTE) silicon
CR602	48C82392B03	silicon
CR603	48C82392B03	silicon
CR604	48C82392B03	silicon
Q601	48R869570	TRANSISTOR: (SEE NOTE) N-P-N; type M9570
Q602	48R869570	N-P-N; type M9570
Q603	48R869570	N-P-N; type M9570
Q604	48R869568	N-P-N; type M9568
R601	6S127803	RESISTOR, fixed: ±10%; 1/4 W; 1.5k
R602	6S128902	47k
R603	6S129147	220k
R604	6S128902	47k
R605	6S128904	18k
R606	6S128902	47k
R607	6S127802	1k
R608	6S128902	47k
R609	6S127802	1k
R610	6S127802	1k
NON-REFERENCED ITEM		
	TLN4482A	PRINTED CIRCUIT BOARD (complete)

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

RF DECK

MODEL TLD8370A SERIES

MODEL TABLE

MODEL	FREQUENCY RANGE
TLD8371A	136-150.8 MHz
TLD8372A	150.8-174 MHz

TECHNICAL CHARACTERISTICS

EIA SINAD INTERMODULATION	-70 dB
SENSITIVITY	Less than 0.35 microvolt for 20 dB quieting; Less than 0.25 microvolt for EIA SINAD; 50-ohms rf input impedance.
SPURIOUS & IMAGE REJECTION	more than 90 dB
SQUELCH	Carrier squelch; noise compensated type, adjustable sensitivity, threshold sensitivity of 0.18 microvolt. "Private-Line" tone-coded squelch; also includes a tone-operated squelch circuit, adjustable sensitivity, threshold sensitivity of 0.18 microvolt.

1. DESCRIPTION

This optional rf deck is intended for use in a 136-174 MHz solid-state consolette base radio to obtain improved receiver sensitivity. The improved sensitivity, however, lowers intermodulation protection approximately 10 dB.

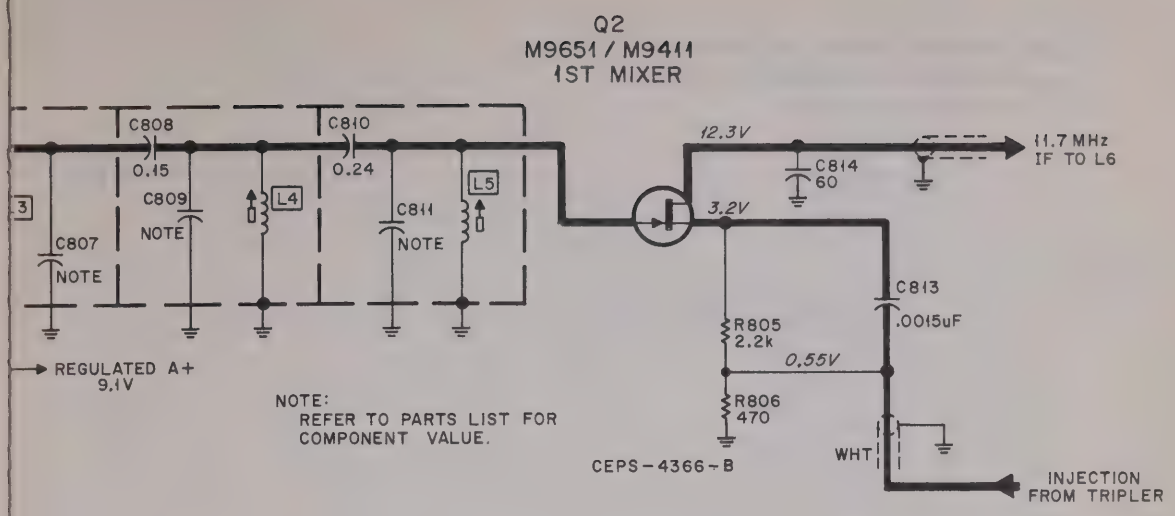
2. THEORY OF OPERATION

This optional rf deck employs the same input and mixer circuitry as the standard rf deck. It differs by the addition of an rf amplifier (Q1 with associated components) which amplifies the rf signal before the first mixer stage. In addition, Q2 employs a different transistor type.

3. MAINTENANCE

DC voltages are shown on the schematic diagram and circuit board detail at the end of this section. RF voltages in other receiver circuits, but which are dependent upon this optional rf deck, are shown on the transmitter-receiver schematic and intercabling diagram. They are identified as (optional rf voltages). Standard and optional rf voltages at the indicated test points are obtained with identical input signal levels. An additional rf voltage may be measured on this rf deck at the junction of R804 and C815. It is 0.25 V rf with a 30 mV rf input signal.

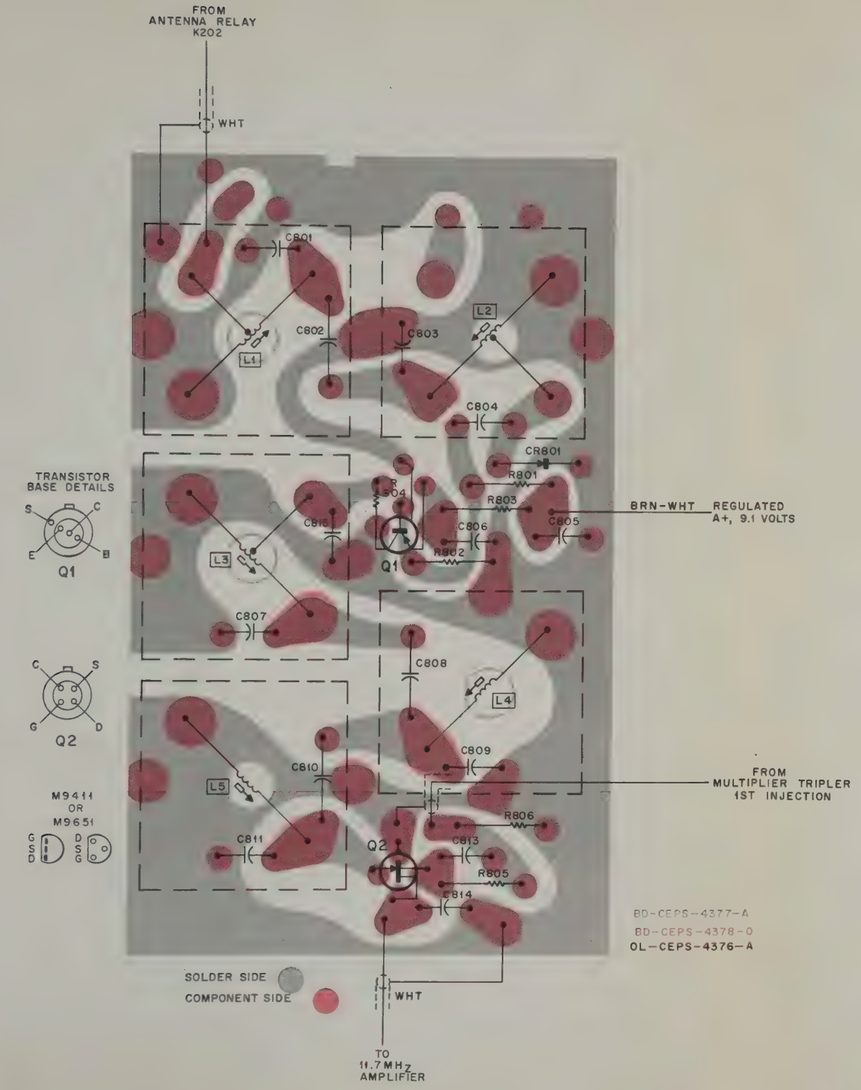
MOTOROLA INC.
ENGINEERING PUBLICATIONS
1301 E. ALGONQUIN ROAD
Communications Division
SCHAUMBURG, ILLINOIS 60172

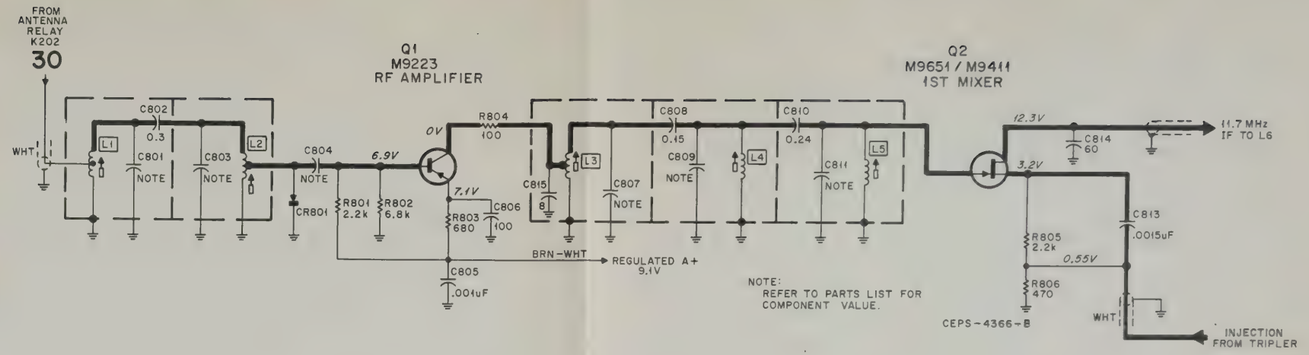


RF DECK

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Model TLD8370A Series RF Deck
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E99-A
2/7/73-UP





MODEL TABLE

BOARD NO.	SUFFIX NO.
TLD8371A	-2
TLD8372A	-1

EPS-4368-O

RF DECK

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Model TLD8370A Series RF Deck
Schematic Diagram & Circuit Board Detail
Motorola No. 63P81010E99-A.
2/7/73-UP

PARTS LIST

IMPORTANT

USE ONLY THE FOLLOWING MOTOROLA PART NUMBERS WHEN ORDERING REPLACEMENT PARTS

LEGEND

L = 136-150.8 MHz
M = 150.8-162 MHz
H = 162-174 MHz

TLD8371A RF Deck (136-150.8 MHz)
TLD8372A RF Deck (150.8-174 MHz) PL-1110-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF; ±5%; 500 V; unl. stated
C801L	21K851845	11 ±0.5 pF; NP0
C801M	21K847743	8 ±0.5 pF; NP0
C801H	21K847743	8 ±0.5 pF; NP0
C802	21K830201	0.3
C803L	21K851845	11 ±0.5 pF; NP0
C803M	21K847743	8 ±0.5 pF; NP0
C803H	21K847743	8 ±0.5 pF; NP0
C804L	21D82355B20	14; NZ20
C804M	21K851845	11 ±0.5 pF; NP0
C804H	21K851845	11 ±0.5 pF; NP0
C805	21D82187B20	.001 uF ±10%; 100 V
C806	21D82133G03	100; N750
C807L	21K851845	11 ±0.5 pF; NP0
C807M	21K847743	8 ±0.5 pF; NP0
C807H	21K847743	8 ±0.5 pF; NP0
C808	21K881064	0.15
C809L	21K851845	11 ±0.5 pF; NP0
C809M	21K847743	8 ±0.5 pF; NP0
C809H	21K847743	8 ±0.5 pF; NP0
C810	21K867162	0.24
C811L	21K847743	8 ±0.5 pF; NP0
C811M	21D82133G53	5 ±0.5 pF; NP0
C811H	21D82133G53	5 ±0.5 pF; NP0
C812L		NOT USED
C812M		NOT USED
C812H		NOT USED
C813	21C82187B18	.0015 uF ±10%; 100 V
C814	21E82537B19	60; 100 V
C815	21K867807	8; N080
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR801	48C83654H01	silicon
		COIL, RF:
L1	24D84971A02	2-1/2 turns; tapped; coded RED; incl. 76C83156H09 CORE, tuning; coded ORG
L2	24D84971A02	2-1/2 turns; tapped; coded RED; incl. 76C83156H09 CORE, tuning: coded ORG
L3	24D84971A02	2-1/2 turns; tapped; coded RED; incl. 76C83156H09 CORE, tuning: coded ORG
L4	24D84971A01	2-1/2 turns; coded BRN; incl. 76C83156H09 CORE, tuning: coded ORG
L5	24D84971A01	2-1/2 turns; coded BRN; incl. 76C83156H09 CORE, tuning coded ORG
		TRANSISTOR: (SEE NOTE)
Q1	48R869233	P-N-P; type M9223
Q2	48R869651 or 48R869411	field-effect; type M9651 field-effect; type M9411
		RESISTOR, fixed: ±10%; 1/4 W;
R801	6S128689	2.2K
R802	6S128687	6.8K
R803	6S128599	680
R804	6S129753	100
R805	6S128689	2.2K
R806	6S127801	470

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
NON-REFERENCED ITEMS		
	26B84957B01	SHIELD, coil: 4 req'd
	1V80713B02	COIL SHIELD ASSY

NOTE:

Replacement diodes and transistors must be ordered by Motorola part number only for optimum performance.

MOTOROLA

INSTRUCTION MANUAL REVISION

SMR-1893A

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

INSTRUCTION MANUAL AFFECTED:

68P81018E45-C 136-174 MHz "CONSOLETTE" Base Station

REVISION DETAILS:

POWER SUPPLY SECTION

Schematic Diagram Affected: 63P81010E92-E

Models Affected: TPN1084A, TPN1088A

Parts List Changes:

1. Diodes CR201 and CR202 are changed to Motorola Part No. 48C82732C07.

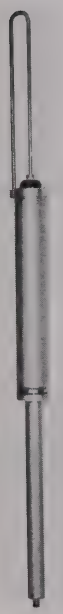
2. Diodes CR203 and CR204 are changed to Motorola Part No. 48C82732C10.

MOTOROLA

FOLDED COAXIAL ANTENNA KIT

UNITY GAIN TYPE
FOR BASE STATIONS

MC6569



MODEL TABLE

Frequency	Model No.	Antenna Unit	Clamp Kit
136-141 MC	TAD1001B	TAD6071A	TLN6685A
141-150 MC	TAD1002B	TAD6072A	
150-162 MC	TAD1003B	TAD6073A	
162-174 MC	TAD1004B	TAD6074A	

1. DESCRIPTION

The Motorola TAD1000B Series Folded Coaxial Antenna Kits use a vertically polarized coaxial dipole configuration antenna, which provides an omnidirectional radiation pattern. A unique grounded element minimizes received signal degradation caused by precipitation static and other forms of electrostatic discharges.

The antenna kits include a TAD6070A Series Antenna and a TLN6685A Mounting Clamp Kit.

The d-c ground feature also provides a degree of protection against destructive voltage surges which can be induced in the antenna by lightning strikes.

These antennas provide as much as 1.5 db gain over typical "ground-plane" antennas because of their increased radiating aperture and low angle of radiation. Mast coupling and pattern distortion has been minimized through careful design of the coaxial skirt section. A low-loss, broadband matching transformer is mounted in the support staff to maintain less than 1.5 vswr (voltage standing wave ratio) over the frequency range specified in the MODEL TABLE.

The antennas are made from non-ferrous materials and use stainless steel hardware to minimize the possibility of performance degradation caused by rust and corrosion. To preserve the omnidirectional pattern of the antenna, the bottom of the coaxial skirt must be mounted above all surrounding metal objects. The antenna is equipped with a uhf connector which will accept any PL-259 (or equivalent) uhf plug.

The TLN6685A Mounting Clamp Kit holds the antenna to the tower mast (or other structural members) as shown in the illustration for Step 2. The kit is made of aluminum alloy with stainless steel hardware to prevent rust and corrosion.

Motorola "foamed dielectric" transmission line kits are recommended for these antennas. The "foamed dielectric" transmission line kit using the 1/2" cable should not be used for lengths in excess of 100 feet. The 7/8" cable permits lengths up to 300 feet. For distance in excess of 300 feet consult with your Motorola representative for the appropriate transmission line kit to use.

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Engineering Publications 4501 W. Augusta Blvd. Chicago 51, Illinois

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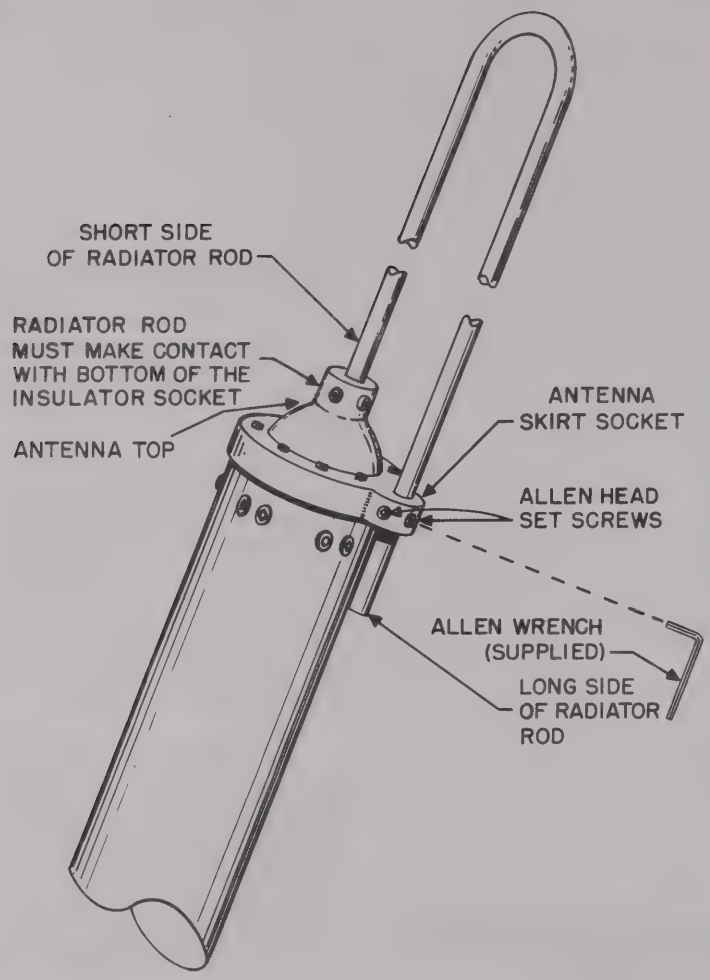
68P81108A58
Issue - O

STEP 1



BEPD-6193-O

"Hairpin" Radiator Assembly Detail.

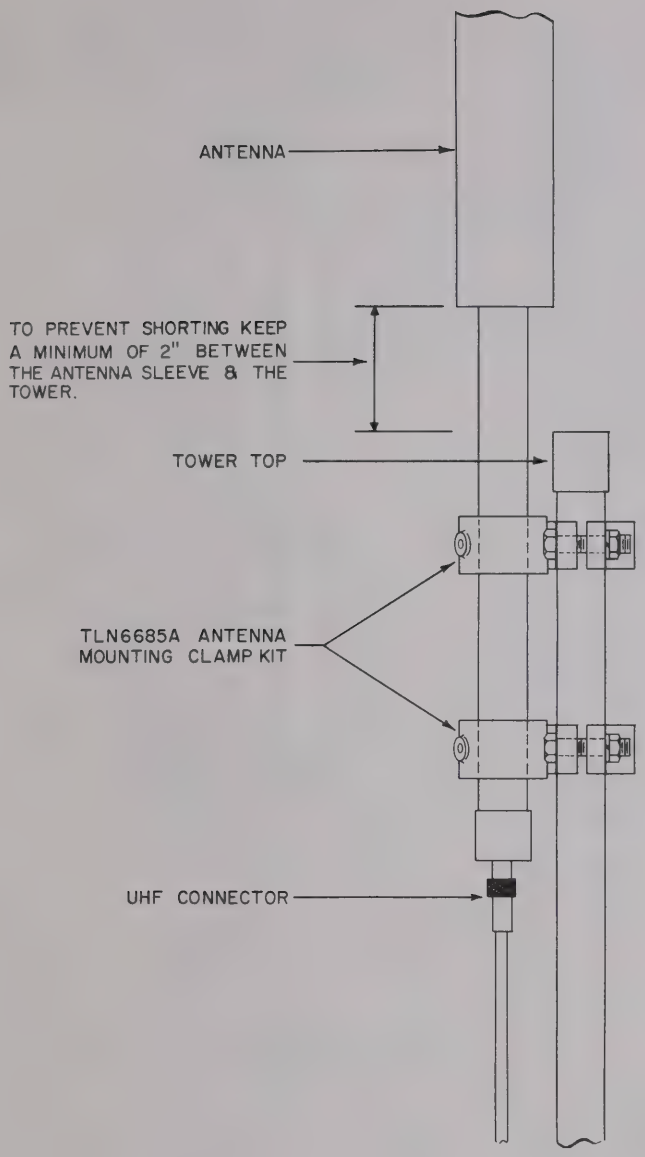
2. INSTALLATION

The assembly of the antenna must be completed by fastening the "hairpin" radiator to the insulator-hub assembly before mounting the clamps to the antenna. Refer to steps 1 and 2 for complete installation details.

NOTE

The radiator rod must make contact with bottom of the insulator socket for proper operation. Apply pressure to the top of the radiator rod while tightening the "Allen" head setscrews to make a good contact.

STEP 2

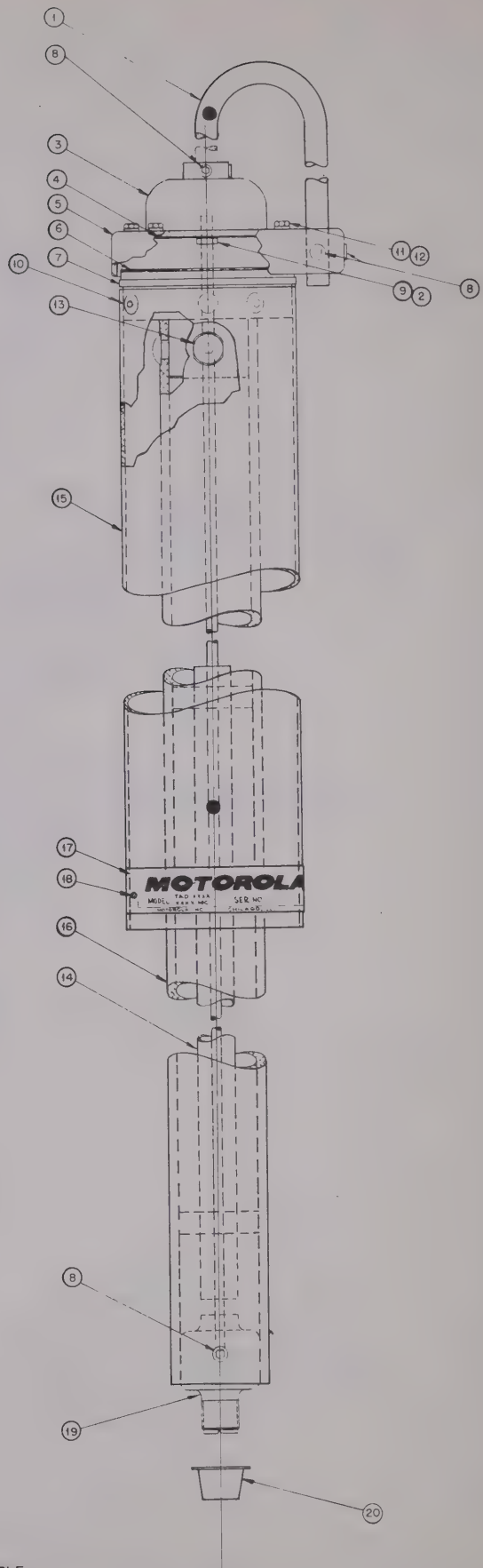

ANTENNA
TO PREVENT SHORTING KEEP A MINIMUM OF 2" BETWEEN THE ANTENNA SLEEVE & THE TOWER.
TOWER TOP
TLN6685A ANTENNA MOUNTING CLAMP KIT
UHF CONNECTOR

MOUNTING PROCEDURE

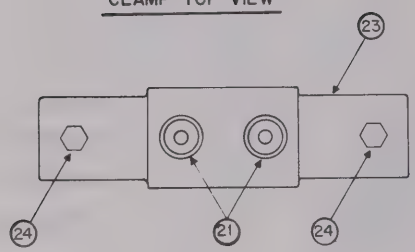
1. SLIDE CLAMPS OVER ANTENNA.
2. TIGHTEN SET SCREWS.
3. MOUNT ANTENNA TO TOWER.

CEPD-10585-O

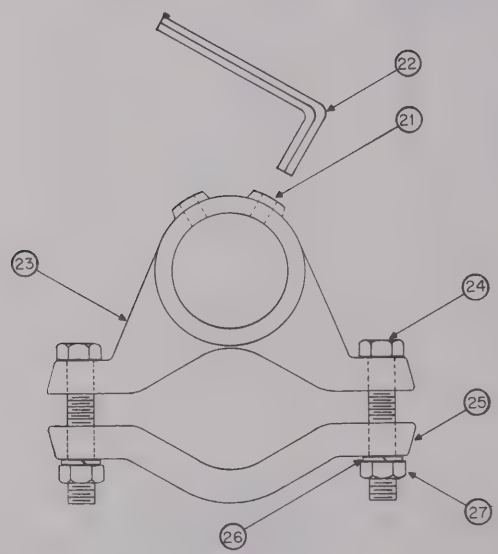
Antenna and Mounting Clamp Installation.



CLAMP TOP VIEW



CLAMP SIDE VIEW



MODEL TABLE

FREQUENCY	MODEL NO.	SUFFIX	ANTENNA UNIT	CLAMP KIT
136-141MC	TAD1001B		TAD6071A	TLN6685A
141-150MC	TAD1002B		TAD6072A	
150-162MC	TAD1003B		TAD6073A	
162-174MC	TAD1004B		TAD6074A	

DIAGRAM NO. 69D81108A60

Model TAD1000B Series
Antenna & Mounting Clamp
Installation Detail
Motorola No. 69D81108A60-O
8/1/64-UP

PARTS LIST for Detail Diagram 69D81108A60-O

ITEM NO.	QTY	MOTOROLA PART NO.	DESCRIPTION
1	1	47B82736B01	ELEMENT, antenna (used on TAD6071A)
1	1	47B82736B03	ELEMENT, antenna (used on TAD6072A)
1	1	47B82736B05	ELEMENT, antenna (used on TAD6073A)
1	1	47B82736B07	ELEMENT, antenna (used on TAD6074A)
2	9	4S400368	LOCKWASHER, split: #10; sst
3	1	14C82943B02	INSULATOR, antenna hub
4	1	32A475396	GASKET
5	1	42C82737B01	RING, clamping
6	1	42A85708	RING, compressor
7	1	43C82738B01	HUB, antenna
8	7	3S131779	SETSCREW, ALLEN: 1/4"-20 x 1/4"; sst
9	1	2S1359	NUT, hex: #10-32; sst
10	8	3B82739B01	CAPSCREW, ALLEN: #10-32 x 1/2"; sst
11	8	3S125496	MACHINE SCREW: #8-32 x 1"; sst
12	8	4S9746	LOCKWASHER, split: #8; sst
13	4	3B82739B02	CAPSCREW, ALLEN: 5/16"-18 x 3/8"; sst
14	1	1B82741B01	TRANSFORMER ASSY., antenna (used on TAD6071A)
14	1	1B82741B02	TRANSFORMER ASSY., antenna (used on TAD6072A)
14	1	1B82741B03	TRANSFORMER ASSY., antenna (used on TAD6073A)
14	1	1B82741B04	TRANSFORMER ASSY., antenna (used on TAD6074A)
15	1	47B82745B01	TUBING, skirt (used on TAD6071A)
15	1	47B82745B03	TUBING, skirt (used on TAD6072A)
15	1	47B82745B05	TUBING, skirt (used on TAD6073A)
15	1	47B82745B07	TUBING, skirt (used on TAD6074A)
16	1	47B82744B01	PIPE, antenna mounting
17	1	33A82028D01	NAMEPLATE
18	2	3A892219	SCREW, special: one-way slot; #3-48 x 3/16"
19	1	1B82748B01	CONNECTOR ASSY., coaxial
20	1	15B82747B01	CAP, tapered plastic
NON-REFERENCED ITEM			
	1	66K108154	WRENCH, ALLEN

TLN6685A Mounting Clamp Kit

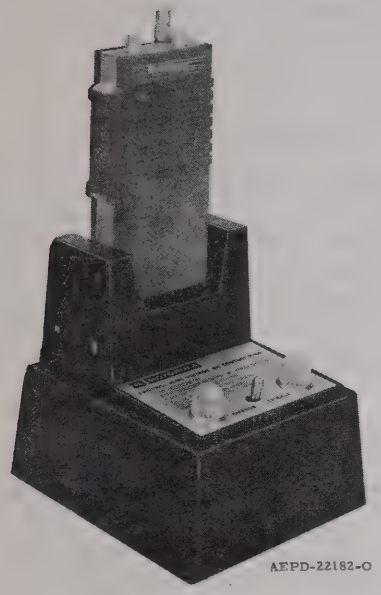
21	4	3S134159	SETSCREW: 5/16-18 x 3/8" socket head
22	1	66K108219	KEY, socket head screw ("Allen" wrench); 5/32"
23	2	42C82006H01	CLAMP, antenna mounting (large)
24	4	3S131910	SCREW, machine: 3/8-16 x 3-1/2" plain hex
25	4	42A82167C01	CLAMP, antenna mounting (small)
26	4	4S9748	LOCKWASHER: 3/8" split
27	4	2S1379	NUT, machine: 3/8-16 x 5/8"

MOTOROLA

SINGLE UNIT

BATTERY CHARGER

MODEL NLN6684A



Model NLN6684A
Single Unit Charger

1. INTRODUCTION

The Model NLN6684A Single Unit Battery Charger is an accessory item for the H23FFN Series "Handie-Talkie" ® FM Radio using the nickel-cadmium battery power supply. It is approved under the manufacturer's guarantee covering the NLN6682A Nickel-Cadmium Battery Kit.

The charger will recharge the nickel-cadmium battery either in or out of the radio housing.

2. DESCRIPTION

This unit is a constant current charger (16 hour charge rate) and contains a trickle charge circuit. If a fully charged battery is to be left unattended for a long period of time, it's full charge can be maintained by placing the CHARGE-TRICKLE switch in the TRICKLE position.

This charger operates from a 105-125 volts, 50-60 Hertz source. The power transformer has a tapped primary winding which is used to correct for high or low line voltage conditions.

The unit contains charge rate lamp type #1829 (Motorola Part Number 65K810161) in the circuit and should be used with typical duty cycle requirements. With this lamp (DS2) the charger will replace the charge removed from a battery when used in a duty cycle of 5% transmit, 5% receive and 90% standby. This duty cycle represents a 30 second transmission every 10 minutes in an 8-hour day.

3. OPERATION

Place the battery charger in operation, as follows:

a. Connect the a-c line cord to a 105-125 volt, 50-60 cps source. Set the CHARGE-TRICKLE switch to CHARGE.

NOTE

Normal operation calls for eight hours use of the battery followed by 16 hours of charge. Always return to TRICKLE after 16 hours of charging.

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1/28/72-GCC

68P81059A53
Issue - E

b. Place the ON-OFF switch on the radio in the OFF position.

c. Insert the bottom end of the radio set with the speaker to the front, or the battery only, into the charger receptacle making sure that the battery or radiophone is seated firmly. The CHARGE lamp will light indicating that the battery is being charged.

NOTE

MAKE SURE THE LAMP GLOWS, OTHERWISE THE BATTERY IS NOT CHARGING.

d. Allow sufficient time for the battery to charge (16 hours insures a complete charge).

e. If the battery is to be charged for periods exceeding 16 hours, the CHARGE-TRICKLE switch must be set to TRICKLE.

WARNING

Do not discard batteries in fire as they may explode.

4. MAINTENANCE

a. Fuse

If the charger does not operate, check the fuse. Replace it if necessary. If the replaced fuse "blows", check the transformer secondary and rectifier for a short circuit. A short circuit existing across the contact pins of the charger receptacle will not cause the fuse to "blow".

b. High and Low Line Voltage Adjustment

Check the a-c line voltage to the charger. If the line voltage is above 125 volts, remove power from the charger. Remove the line cord lead from the GRN-BLK transformer lead on the terminal board and connect it to the RED-BLK transformer lead.

If the line voltage is below 105 volts, remove the line cord lead from the GRN-BLK lead on the terminal board and connect it to the YEL-BLK transformer lead.

c. Charging Current

To check the charging current at the charger receptacle, place a 0-120 ma meter across the terminal lugs connected to the back of the contact pins of the charger receptacle. With 117 volts a-c applied to the charger, the reading on the meter should be approximately 38 ma with the #1829 lamp. The CHARGE lamp should light when the meter is connected.

d. Trickle Current

To check the trickle current at the charger receptacle, place a 0-12 ma meter across the terminal lugs connected to the back of the contact pins of the charger receptacle. With 117 volts a-c applied to the charger, the reading on the meter should be approximately 3 ma. The TRICKLE lamp should light when the meter is connected.

e. Contact Pins

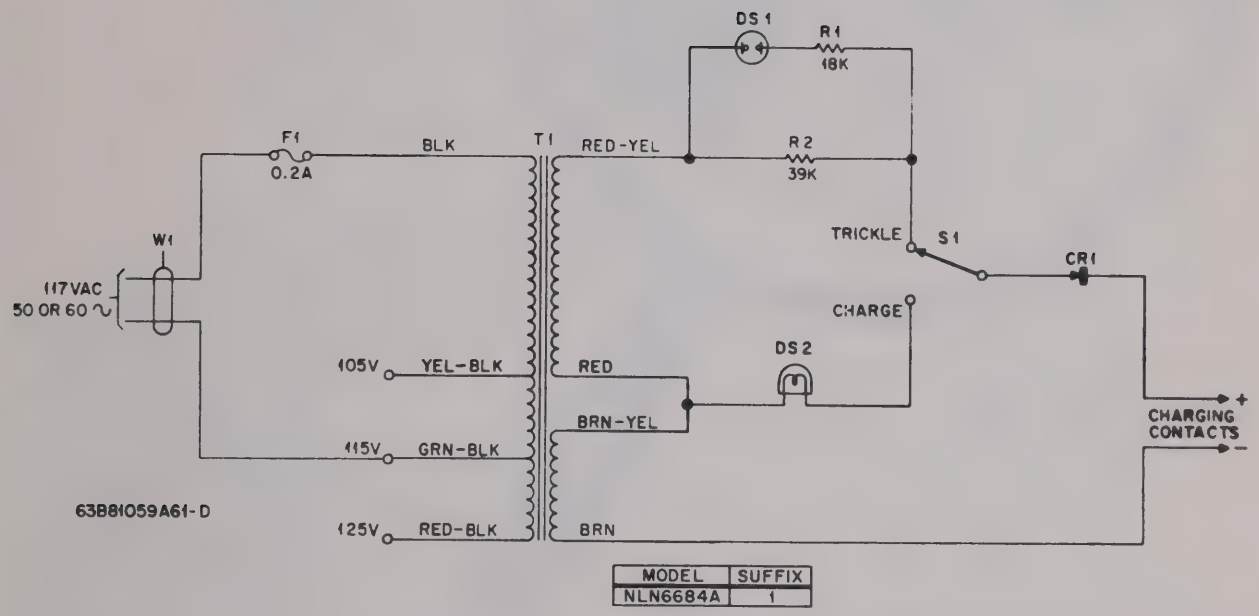
WARNING

HIGH VOLTAGE exists across the contact pins of the charging receptacle when the unit is in TRICKLE operation. Be sure that the charger is disconnected from the a-c line supply voltage before attempting to do any work on these contact pins.

If the unit has the correct output current, but neither lamp lights when the radio is placed in it, check the contact pins of the radio and charger for dirt and grease or other material which may prevent the pins of the radio from making good contact with the pins of the charger receptacle.

NOTE

The radio set incorporates a safety feature to prevent charging mercury batteries. Therefore, if a mercury battery equipped radio set is placed in the charger, neither lamp will light.



MODEL	SUFFIX
NLN6684A	1

PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

Single Unit Battery Charger
Schematic Diagram
Motorola No. 63B81059A61-D
1/28/72-GCC

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NLN6684A	DS2	WAS 15K81061	PARTS LIST
			ADDED 1V80787A27 HOUSING AND CONTACT ASSEMBLY	NON-REFERENCED ITEMS
A1	NLN6684A	NON-REF.	COVER PLATE WAS 64B83648H01	PARTS LIST
B	NLN6684A	W1	WAS 30C865903	PARTS LIST
C	NLN6684A	NON-REF.	MACHINE SCREW WAS 3S2902	PARTS LIST
C1	NLN6684A	NON-REF	WASHER WAS 4A82094A04, CONTACT, WAS 39A82092A04; REMOVED 29S132531 SOLDER LUG, 3S1921 MACHINE SCREW, 4S8406 #2 WASHER	NONE
C2	NLN6684A	CR1	WAS 48C82466H14	NONE
D	NLN6684A-1		CONTACT WAS 39B82460J01	PARTS LIST

PARTS LIST

NLN6684A Battery Charger EPD-21905-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		SEMICONDUCTOR DEVICE, diode: (NOTE)
CR1	48C82466H18	silicon
		LAMP, glow:
DS1	65K818438	neon; NE51-H
		LAMP, incandescent:
DS2	65K810161	28 v; 70 ma; min. bay base; type #1829
		FUSE, cartridge:
F1	65K480555	0.2 a; 125 v
		RESISTOR, fixed: ±10%; 1/2 w;
R1	6R5591	18K
R2	6R6487	39K
		SWITCH, toggle:
S1	40A80248	spdt
		TRANSFORMER, power: 50/60 Hz :
T1	25C82228E01	pri: BLK (common) YEL-BLK (105 v tap) GRN-BLK (115 v tap) RED-BLK (125 v) (full winding); res 100 ±10% sec: (h.v.); RED, RED-YEL; res 290 ±10% sec: (l.v.); BRN, BRN-YEL; res 30 ±10%
		CABLE ASSEMBLY, power:
W1	30B82248E01	2 conductor; rubber covered: each conductor No. 18 str; incl 2 contact male plug
		LAMPHOLDER:
XDS1, 2	60K17135	single contact; min. bay.; does not include the following parts: 14K18684 WASHER, insulating 43K859511 BUSHING, mounting 60A898914 LENS, fluted; clear
		FUSEHOLDER:
XF1	9C82083C02	single fuse mounting: extractor post type
NON-REFERENCED ITEMS		
	31S124667	3 solder lug terminals (No. 1, 2, 3) plus mounting lug (No. 4)
	31R121255	3 solder lug terminals (No. 2, 3, 4) plus mounting lug (No. 1)
	42B82018H05	RETAINER, cable
	1V80787A27	BATTERY CONTACT and HOUSING assy. incl 1V80789A26 SPRING, compression; 2 req'd 4B84734H01 WASHER, spring, 2 req'd 39B05605A01 CONTACT; 2 req'd 14B82296E01 INSULATOR, slide 2 req'd 64B83648H02 PLATE, cover; 2 req'd 41A83572H01 SPRING, concial 2 req'd 3S136554 SCREW, tapping #2 x 1/4"; 8 req'd

NOTE:
Replacement of diodes must be ordered by Motorola part number only for optimum performance.

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MOTOROLA INC. COMMUNICATIONS DIVISION • **INSTRUCTION MANUAL**

136-174 MHz
1.8 W RF POWER

MOTOROLA

HT220 SERIES

Slim-Line And Omni-Housing Carrier And "Private-Line" Squelch "Handie-Talkie"® FM Radio

68P81067A85-A

MOTOROLA

"HANDIE-TALKIE"

FM RADIO

SLIM-LINE HOUSING

OMNI-HOUSING

"PRIVATE-LINE" SQUELCH

CARRIER SQUELCH

136-174 MHz

PORTABLE SOLID-STATE

Slim-Line Housing
with Remote
Speaker/Microphone

AEPD-22366-O

Slim-Line Housing
with Internal
Speaker/Microphone

Omni-Housing
with Universal
Speaker/Microphone

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68P81067A85
Issue-- A

PERFORMANCE SPECIFICATIONS

GENERAL

MODEL	H23FFN SERIES				
FREQUENCY RANGE	136-174 MHz				
POWER SUPPLY	(1) Mercury battery, or (1) nickel-cadmium battery				
BATTERY DRAIN @ 15 v dc (note 1)	Internal Spkr/Mic Unit		Universal Unit		Remote Unit
Standby	4.3 ma		4.3 ma		4.3 ma
Receive	65 ma		65 ma		65 ma
Transmit	310 ma		330 ma		330 ma
BATTERY LIFE (note 1)	Slim-Line Housing		Omni-Housing		
Mercury battery	Duty Cycle: 5-5-90% (note 2)		Duty Cycle: 10-10-80% (note 3)		
Nickel-Cadmium battery	46 hrs 8 hrs charge		40 hrs 8 hrs charge		
DIMENSIONS (note 1)	Intl Spkr/Mic	Rmt Spkr/Mic	Intl Spkr/Mic	Rmt Spkr/Mic	Univ Spkr/Mic
Height	6.95 in.	6.95 in.	6.95 in.	6.95 in.	6.95 in.
Width	2.75 in.	3.19 in.	2.75 in.	3.19 in.	3.19 in.
Depth	1.22 in.	1.22 in.	1.75 in.	1.75 in.	1.75 in.
WEIGHT					
Mercury battery	20.5 oz.	24.5 oz.	27.5 oz.	31.5 oz. (note 4)	28.0 oz. (note 5)
Nickel-Cadmium battery	21.0 oz.	25.0 oz.	28.0 oz.	32.0 oz. (note 4)	28.5 oz. (note 5)
FCC DESIGNATION	CC3538 or CC3539 (depending on model)				

TRANSMITTER

RF OUTPUT Mercury battery Nickel-cadmium battery	 1.0 watt at 12.7 volts dc 1.8 watts at 15.0 volts dc
FREQUENCY STABILITY	±.0005% from -10°C to +50°C, ±.0015% from -30°C to +60°C (25° reference)
MODULATION	Type 16F3, ±5 kHz for 100% modulation at 1000 Hz
CRYSTAL MULT	9 times
SPURIOUS & HARMONICS	More than 46 db below carrier
FM NOISE	At least 40 db below ±3.3 kHz deviation at 1000 Hz
AUDIO RESPONSE	+1, -3 db from 6 db/octave pre-emphasis characteristic from 300-3000 Hz
AUDIO DISTORTION	Less than 10% at 1000 Hz, 2/3 max rated deviation
MAX PERMISSIBLE CHAN SEPARATION	1 MHz, no degradation

RECEIVER

AUDIO OUTPUT	500 mw at less than 10% distortion
FREQUENCY STABILITY	±.0010% from -10°C to +50°C, ±.0015% from -30°C to +60°C (+25° reference)
MODULATION ACCEPTANCE	±7 kHz
SPURIOUS & IMAGE REJECTION	More than 50 db below carrier
SENSITIVITY	.25 uv (12 db Sinad), .35 uv max (20 db quieting)
SELECTIVITY	More than 80 dB at ±30 kHz (EIA Sinad)

PERFORMANCE SPECIFICATIONS (CONT'D)

NOISE SQUELCH SENSITIVITY	Noise compensated type, adjustable, will open at less than 0.18 uv
MAX PERMISSIBLE CHAN SEPARATION	1 MHz (no degradation)
INTERMODULATION	More than 60 dB at adjacent channel
CHANNEL SPACING	30 kHz

NOTES:

1. For "Private-Line" squelch version of any model, add: 2 oz to weight, 3.7 ma to standby drain, 5 ma to receive drain, 5 ma to transmit drain, 0.63 in. to height; Mercury battery life becomes 40 hrs.
2. Indicates 5% transmit, 5% receive with rated af out, 90% standby (slim-line models).
3. Indicates 10% transmit, 10% receive with rated af out, 80% standby (omni-housing models).
4. Includes external Spkr/Mic.
5. Excludes external Spkr/Mic.

Specifications subject to change without notice

FOREWORD

SCOPE OF INSTRUCTION MANUAL

This manual offers descriptive data and service information for the equipment listed in the model chart. Service diagrams, parts list, and printed circuit board details are also part of this instruction manual.

NOMENCLATURE

Motorola equipment is specifically identified by the model number on the nameplate.

NOTE

Be sure to use the entire model number when making inquiries about your equipment.

Identifiers have been assigned to chassis and kits. Use these identifiers when requesting information or ordering replacements.

A model chart is located in the front of this manual.

PRODUCTION CHANGES

When production and engineering changes are incorporated into the equipment, a revision number is assigned to the chassis or kit affected; -1, -2, -3, etc.

The chassis number complete with revision number, if any, is stamped on the chassis at the time of production. The revision number becomes an integral part of the chassis identifier. Revisions, if any, are listed on the schematic diagram.

INSTRUCTION MANUAL REVISIONS

Changes which occur after an instruction manual is printed are described in the Instruction Manual Revision. These bulletins give the reader complete information on the change including pertinent parts listing data.

NATIONAL SERVICE ORGANIZATION

Motorola provides a nation-wide service organization. Through its maintenance and installation program, Motorola makes available the finest service to those desiring reliable continuous communications on a contract basis.

Motorola's National Service Organization is the largest service organization specializing in mobile communications. It includes over 800 independently owned and operated service stations, strategically located and manned by a force of several thousand FCC licensed personnel.

The area administrative forces, district service managers and district service representatives are in the direct employ of Motorola.

For your contract service requirements, please contact your local Motorola representative or write to:

National Service Manager
Motorola Communications Division
1301 Algonquin Road, Schaumburg, Illinois 60172
Tel. 312-358-7900 TWX 910-693-1595

CAREFUL USE OF THE INSTRUCTION MANUAL AND THE MANY SUGGESTIONS CONTAINED IN IT WILL FURTHER INSURE PROPERLY INSTALLED AND MAINTAINED EQUIPMENT. IF ANY DISCREPANCY EXISTS BETWEEN THIS INSTRUCTION MANUAL AND YOUR EQUIPMENT, PLEASE NOTIFY ENGINEERING PUBLICATIONS AT THE ADDRESS SHOWN ON THE FRONT TITLE SHEET.

REPLACEMENT PARTS ORDERING

ORDERING INFORMATION

Motorola maintains parts and service depots and authorized service stations strategically located throughout the country. These facilities are fully equipped to give the finest service. Orders for all parts except crystals, channel elements, "Vibrasender" and "Vibrasponder" resonant reeds, and "Permacode" active filters should be sent to the nearest parts depot. Orders for instruction manuals should also be sent to the parts depot.

When ordering replacement parts, the complete number identification of the item must be used whether it be a component, kit or complete chassis. This will fix proper identification and assure delivery of the desired item. Complete number identification should also be used when requesting equipment information.

Crystal and channel element orders should specify the crystal or channel element type number, crystal frequency, carrier frequency, and the chassis model number in which the part is used.

Orders for "Vibrasender" and "Vibrasponder" resonant reeds, and "Permacode" active filters should specify the type number and frequency and should identify the owner/operator of the communications system in which these items are to be used.

PARTS DEPOT

2333 Utah Avenue, El Segundo, California 90245
Tel. 213-644-1101 - TWX 910-348-6278

1170 Chess Drive, San Mateo, California 94404
Tel. 415-349-3111 - TWX 910-375-3877

P.O. Drawer 1 Forest Park, Georgia 30050
Tel. 404-762-6183 - TWX 810-751-8300

1875 Greenleaf Ave., Elk Grove Village, Ill. 60007
Tel. 312-439-7150 - TWX 910-222-2868

85 Harristown Road, Glen Rock, New Jersey 07452
Tel. 201-447-4000 - TWX 710-988-5602

3220 Belt Line Road, Dallas, Texas 75234
Tel. 214-241-2151 - TWX 910-860-5505

12955 Snow Road, Parma, Ohio 44130
Tel. 216-267-2210 - TWX 810-421-8845

FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, RESONANT REED, AND "PERMACODE" ACTIVE FILTER ORDERS.

AIR MAIL ORDERS

Motorola, Inc.
Component Service Department
P.O. Box 66191
O'Hare International Airport
Chicago, Illinois 60666

REGULAR MAIL ORDERS AND CORRESPONDENCE

Motorola, Inc.
Component Service Department
4545 W. Augusta Boulevard
Chicago, Illinois 60651

TABLE OF EQUIVALENT UNITS

UNIT	ABBREVIATIONS	REPLACES
hertz	Hz	cycle
kilohertz	kHz	kilocycle (kc)
megahertz	MHz	megacycle (mc)
picofarad	pF	micromicofarad (uuf)

CONTENTS

SECTION	NUMBER
Guaranteed Performance Specifications	ii
Model Chart	ix
Required Accessories	xi
Optional Accessories	xiii
DESCRIPTION AND OPERATION	
Description	1
Pre-Operational Notes	1
Operation	2
BATTERY REPLACEMENT AND CHARGING	
Battery Replacement Procedure	3
Nickel-Cadmium Battery Kits	4
DESCRIPTION OF ITEMS	
General	5
Description	5
THEORY OF OPERATION	
General	6
Circuit Theory	7
MAINTENANCE	
Test Equipment	11
Test Procedure	13
Disassembly Procedure	15
Disassembly Procedures (Advanced)	15
Receiver Troubleshooting Chart	15
Transmitter Troubleshooting Chart	16
Receiver Stage Analysis	16
Transmitter Service Notes	16
Repair Techniques	17
SERVICE CHARTS AND DIAGRAMS	
Receiver Alignment Procedure	25
Transmitter Alignment Procedure	27
I. D. C. Adjustment Procedure	28
NMN6041B and NMN6042B Remote Speaker and Microphone Schematic Diagram	29
NMN6041B and NMN6042B Remote Speaker and Microphone Exploded View	30
NMN6048B and NMN6049B External (Universal) Speaker and Microphone Schematic Diagram	31
NMN6048B and NMN6049B External (Universal) Speaker and Microphone Exploded View	32
Exploded View of Radio Chassis, Typical Carrier Squelch, Internal Speaker/Microphone Model	33
Exploded View of Radio Chassis, Typical Carrier Squelch, Remote Speaker/Microphone Model	34

CONTENTS

SECTION	NUMBER
Exploded View of Radio Chassis, Typical "Private-Line" Squelch, Universal Speaker/Microphone Model	35
Five and Six Frequency Printed Circuit Board Detail	37
"Private-Line" Feature, Schematic Diagram and Printed Circuit Board Detail	39
Transmitter-Receiver Printed Circuit Board Details:	
Carrier Squelch, Internal and Remote Speaker/Microphone, 1 and 2 Frequency	41
"Private-Line" Squelch, Internal and Remote Speaker/Microphone, 1 and 2 Frequency	42
Carrier and "Private-Line" Squelch, Internal and Remote Speaker/Microphone, 3 to 6 Frequency	43
Carrier and "Private-Line" Squelch, Universal Speaker/Microphone, 1 to 6 Frequency	44
Receiver Portion, Carrier and "Private-Line" Squelch, Internal and Remote Speaker/Microphone, Schematic Diagram	45
Receiver Portion, Carrier and "Private-Line" Squelch, Universal Speaker/Microphone Schematic Diagram	47
Transmitter Portion, Carrier and "Private-Line" Squelch, Internal and Remote Speaker/Microphone Schematic Diagram	49
Transmitter Portion, Carrier and "Private-Line" Squelch, Universal Speaker/Microphone Schematic Diagram	51

MOTOROLA "Handie-Talkie", "Private-Line", "Vibrasponder", "Vibrasender", "I. D. C.", and "Permacode" are trademarks of Motorola, Inc.

NLN8076A	MISCELLANEOUS PARTS KIT
NLN8078A	REMOTE MICROPHONE MISCELLANEOUS PARTS KIT
NLN6853A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6860A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6861A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6867A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6868A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6876A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6877A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6903A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6905A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6911A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6913A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6748A	EXTENSION SLEEVE
NLN6749A	EXTENSION SLEEVE
NLN6841A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN8032A	FRAME & SWITCH KIT
NLN8033A	FRAME & SWITCH KIT
NLN8034A	FRAME & SWITCH KIT
NLN8035A	FRAME & SWITCH KIT
NLN8044A	FRAME & SWITCH KIT
NLN8045A	FRAME & SWITCH KIT
NLN8036A	TWO FREQ SWITCH KIT
NLN8038A	TWO FREQ SWITCH KIT
NLN8040A	REED SWITCH KIT
NLN8039A	RELAY & BOARD KIT
NLN8031A	"PRIVATE-LINE" DECK
TLN6709B	"VIBRASPONDER" RESONANT REED
NAD6211A	ANTENNA
NLN6686A	CARRYING CASE
NLN6738A	CARRYING CASE
NLN6777A	CARRYING CASE
NLN6778A	CARRYING CASE
NLN6803A	CARRYING CASE
NLN6844A	CARRYING CASE
NLN6845A	CARRYING CASE
NLN6846A	CARRYING CASE
NLN6689A	TUNING TOOLS
NLN6690A	NAMEPLATE
NLN6854A	NAMEPLATE
NLN6857A	NAMEPLATE
NLN6786A	METERING LABEL
NHN6044A	PACKING KIT

MOTOROLA

MODEL CHART

FOR 1.8 WATT

136-174 MHz "HANDIE-TALKIE"

FM TWO-WAY RADIO

CODE:

- X = ONE ITEM SUPPLIED
- ⧸ = ONE ITEM SUPPLIED; DEPENDS ON CARRIER FREQ.
- 3 = TWO TO SIX ITEMS SUPPLIED (AS SHOWN); FREQ DEPENDS ON CARRIER FREQ
- ◢ = ONE ITEM SUPPLIED PER 20 (OR LESS) RADIOS
- * = PART OF UNIFIED CIRCUIT BOARD

MODEL NUMBER	SPEAKER-MICROPHONE	TYPE OF SQUELCH	NUMBER OF XMTR FREQ	NUMBER OF RCVR FREQ
SLIM-LINE HOUSING MODELS				
H23FFN-1100C	INTERNAL	CARRIER	1	1
H23FFN-1110C	INTERNAL	CARRIER	2	1
H23FFN-1130C	INTERNAL	CARRIER	2	2
H23FFN-3100C	INTERNAL	"PRIVATE-LINE"	1	1
H23FFN-3110C	INTERNAL	"PRIVATE-LINE"	2	1
H23FFN-3130C	INTERNAL	"PRIVATE-LINE"	2	2
H23FFN-1102C	REMOTE	CARRIER	1	1
H23FFN-1112C	REMOTE	CARRIER	2	1
H23FFN-1132C	REMOTE	CARRIER	2	2
H23FFN-3102C	REMOTE	"PRIVATE-LINE"	1	1
H23FFN-3112C	REMOTE	"PRIVATE-LINE"	2	1
H23FFN-3132C	REMOTE	"PRIVATE-LINE"	2	2
OMNI-HOUSING MODELS				
H23FFN-1101C	INTERNAL	CARRIER	1	1
H23FFN-1111C	INTERNAL	CARRIER	2	1
H23FFN-1131C	INTERNAL	CARRIER	2	2
H23FFN-1141C	INTERNAL	CARRIER	3	3
H23FFN-1171C	INTERNAL	CARRIER	4	4
H23FFN-1181C	INTERNAL	CARRIER	5	5
H23FFN-1191C	INTERNAL	CARRIER	6	6
H23FFN-3101C	INTERNAL	"PRIVATE-LINE"	1	1
H23FFN-3111C	INTERNAL	"PRIVATE-LINE"	2	1
H23FFN-3131C	INTERNAL	"PRIVATE-LINE"	2	2
H23FFN-3141C	INTERNAL	"PRIVATE-LINE"	3	3
H23FFN-3171C	INTERNAL	"PRIVATE-LINE"	4	4
H23FFN-3181C	INTERNAL	"PRIVATE-LINE"	5	5
H23FFN-3191C	INTERNAL	"PRIVATE-LINE"	6	6
H23FFN-1103C	REMOTE	CARRIER	1	1
H23FFN-1113C	REMOTE	CARRIER	2	1
H23FFN-1133C	REMOTE	CARRIER	2	2
H23FFN-1143C	REMOTE	CARRIER	3	3
H23FFN-1173C	REMOTE	CARRIER	4	4
H23FFN-1183C	REMOTE	CARRIER	5	5
H23FFN-1193C	REMOTE	CARRIER	6	6
H23FFN-3103C	REMOTE	"PRIVATE-LINE"	1	1
H23FFN-3113C	REMOTE	"PRIVATE-LINE"	2	1
H23FFN-3133C	REMOTE	"PRIVATE-LINE"	2	2
H23FFN-3143C	REMOTE	"PRIVATE-LINE"	3	3
H23FFN-3173C	REMOTE	"PRIVATE-LINE"	4	4
H23FFN-3183C	REMOTE	"PRIVATE-LINE"	5	5
H23FFN-3193C	REMOTE	"PRIVATE-LINE"	6	6
H23FFN-1104C	"NIVERSAL	CARRIER	1	1
H23FFN-1114C	"NIVERSAL	CARRIER	2	1
H23FFN-1134D	"NIVERSAL	CARRIER	2	2
H23FFN-1144C	"NIVERSAL	CARRIER	3	3
H23FFN-1174D	"NIVERSAL	CARRIER	4	4
H23FFN-1184C	"NIVERSAL	CARRIER	5	5
H23FFN-1194C	"NIVERSAL	CARRIER	6	6
H23FFN-3104C	"NIVERSAL	"PRIVATE-LINE"	1	1
H23FFN-3114C	"NIVERSAL	"PRIVATE-LINE"	2	1
H23FFN-3134C	"NIVERSAL	"PRIVATE-LINE"	2	2
H23FFN-3144C	"NIVERSAL	"PRIVATE-LINE"	3	3
H23FFN-3174C	"NIVERSAL	"PRIVATE-LINE"	4	4
H23FFN-3184C	"NIVERSAL	"PRIVATE-LINE"	5	5
H23FFN-3194C	"NIVERSAL	"PRIVATE-LINE"	6	6

ITEM	DESCRIPTION
NUD6002AH	UNIFIED CIRCUIT BOARD
*FSMA	RECEIVER 1ST I.F. CRYSTAL FILTER (16.800 MHz)
*YNR	RECEIVER 2ND OSCILLATOR CRYSTAL (SEE RCVR. SCHEMATIC FOR FREQ)
YMRX109	RECEIVER 1ST OSCILLATOR CRYSTAL
YVSR83	TRANSMITTER OSCILLATOR CRYSTAL
	136-150.8 MHz.
	150.8-162 MHz.
NUD6003AH	UNIFIED CIRCUIT BOARD
*FSMA	RECEIVER 1ST IF CRYSTAL FILTER (16.800 MHz)
*YNR	RECEIVER 2ND OSCILLATOR CRYSTAL (SEE RCVR SCHEMATIC FOR FREQ)
YMRX109	RECEIVER 1ST OSCILLATOR CRYSTAL
YVSR83	TRANSMITTER OSCILLATOR CRYSTAL
	162-174 MHz
NUD6004AH	UNIFIED CIRCUIT BOARD
*FSMA	RECEIVER 1ST IF CRYSTAL FILTER (16.800 MHz)
*YNR	RECEIVER 2ND OSCILLATOR CRYSTAL (SEE RCVR SCHEMATIC FOR FREQ)
YMRX109	RECEIVER 1ST OSCILLATOR CRYSTAL
YVSR83	TRANSMITTER OSCILLATOR CRYSTAL
NLN6674S	FRONT COVER KIT
NLN6680C	FRONT COVER KIT
NLN6681C	FRONT COVER KIT
NLN6737C	FRONT COVER KIT
NLN6791C	FRONT COVER KIT
NLN6792C	FRONT COVER KIT
NLN6793C	FRONT COVER KIT
NLN6794C	FRONT COVER KIT
NLN6851C	FRONT COVER KIT
NLN6856C	FRONT COVER KIT
NLN6676A	BACK COVER KIT
NLN6678A	BACK COVER KIT
NLN6750B	BACK COVER KIT
NLN6751B	BACK COVER KIT
NLN6848B	BACK COVER KIT
NLN6852B	BACK COVER KIT
NLN6677A	BATTERY COVER
NLN6752A	BATTERY COVER
NLN6855A	CONNECTOR COVER
NLN6682A	NICKEL-CADMIUM BATTERY KIT
NLN6761A	NICKEL-CADMIUM BATTERY KIT
NMN6042B	SPEAKER-MICROPHONE KIT
NMN6049B	SPEAKER-MICROPHONE KIT
NLN8049A	MISCELLANEOUS PARTS KIT
NLN8051A	MISCELLANEOUS PARTS KIT
NLN8057A	MISCELLANEOUS PARTS KIT
NLN8059A	MISCELLANEOUS PARTS KIT
NLN8061A	MISCELLANEOUS PARTS KIT
NLN8062A	MISCELLANEOUS PARTS KIT
NLN8065A	MISCELLANEOUS PARTS KIT
NLN8066A	MISCELLANEOUS PARTS KIT
NLN8069A	MISCELLANEOUS PARTS KIT
NLN8070A	MISCELLANEOUS PARTS KIT
NLN8071A	MISCELLANEOUS PARTS KIT
NLN8072A	MISCELLANEOUS PARTS KIT
NLN8073A	MISCELLANEOUS PARTS KIT
NLN8074A	MISCELLANEOUS PARTS KIT
NLN8075A	MISCELLANEOUS PARTS KIT
NLN8076A	MISCELLANEOUS PARTS KIT
NLN8078A	REMOTE MICROPHONE MISCELLANEOUS PARTS KIT
NLN6853A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6860A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6861A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6867A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6868A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6876A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN8777A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6903A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6905A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6911A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6913A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6738A	EXTENSION SLEEVE
NLN6743A	EXTENSION SLEEVE
NLN6841A	EXTENSION SLEEVE WITH MULTI-FREQ BOARD
NLN6912A	FRAME & SWITCH KIT
NLN8031A	FRAME & SWITCH KIT
NLN8034A	FRAME & SWITCH KIT
NLN8035A	FRAME & SWITCH KIT
NLN8044A	FRAME & SWITCH KIT
NLN8045A	FRAME & SWITCH KIT
NLN8036A	TWO FREQ SWITCH KIT
NLN8038A	TWO FREQ SWITCH KIT
NLN8040A	REED SWITCH KIT
NLN8039A	RELAY & BOARD KIT
NLN8031AA	"PRIVATE-LINE" DECK
TLN6702B	"VIBRASPONDER" RESONANT REED
NAD6411A	ANTENNA
NLN6085A	CARRYING CASE
NLN6738A	CARRYING CASE
NLN6771A	CARRYING CASE
NLN6776A	CARRYING CASE
NLN8033A	CARRYING CASE
NLN8034A	CARRYING CASE
NLN8045A	CARRYING CASE
NLN8046A	CARRYING CASE
NLN6089A	TUNING TOOLS
NLN6090A	NAMEPLATE
NLN6854A	NAMEPLATE
NLN6786A	NAMEPLATE
NLN6784A	MFTERING LABEL
NDN6044A	PACKING KIT

REQUIRED ACCESSORIES

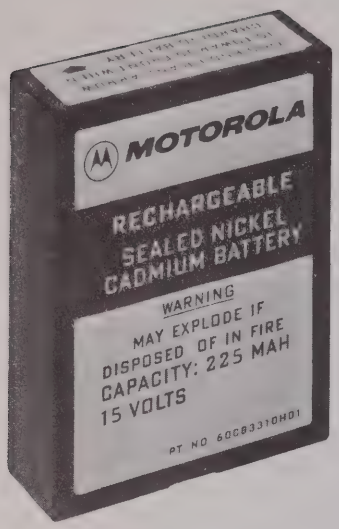
ACCESSORY MODEL NO.	SLIM-LINE RADIOS				
	CARRIER SQUELCH		PRIVATE-LINE SQUELCH		
	INTERNAL SPEAKER	REMOTE SPEAKER	INTERNAL SPEAKER	REMOTE SPEAKER	ACCESSORY NOMENCLATURE
	NLN6682A	NLN6682A	NLN6682A	NLN6682A	Nickel-Cadmium Battery
	NLN6686A	NLN6803A	NLN6738A	NLN6844A	Carrying Case and Cover (or Strap)
	NAD6211A	NAD6211A	NAD6211A	NAD6211A	Antenna, Telescoping
	-	NMN6042B	-	NMN6042B	Remote Speaker/ Microphone

ACCESSORY MODEL NO.	OMNI-HOUSING RADIOS						
	CARRIER SQUELCH			PRIVATE-LINE SQUELCH			
	INTERNAL SPEAKER	REMOTE SPEAKER	UNIVERSAL SPEAKER	INTERNAL SPEAKER	REMOTE SPEAKER	UNIVERSAL SPEAKER	ACCESSORY NOMENCLATURE
	NLN6761A	NLN6761A	NLN6761A	NLN6761A	NLN6761A	NLN6761A	Nickel-Cadmium Battery
	NLN6777A	NLN6845A	NLN6845A	NLN6778A	NLN6846A	NLN6846A	Carrying Case and Cover (or Strap)
	NAD6211A	NAD6211A	NAD6211A	NAD6211A	NAD6211A	NAD6211A	Antenna, Telescoping
	-	NMN6042B	NMN6049B	-	NMN6042B	NMN6049B	Remote Speaker/ Microphone

NOTE:

Above accessories are furnished, as applicable, with each radio listed in the model chart when supplied as a standard package model.

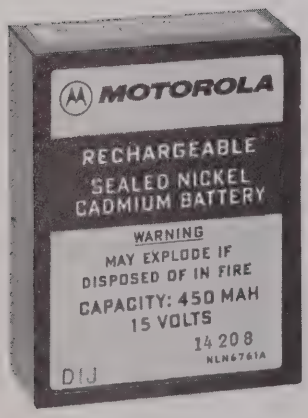
REQUIRED ACCESSORIES (CONT'D)



Model NLN6682A
Nickel-Cadmium Battery
(Optional Rapid Charge
Model NLN6899A Similar)
(CE2286-U86)

Model NLN6777A
Carrying Case and Cover
(Typical)
(CE69100-B16)

Model NAD6211A
Antenna, Telescoping
(CE2286-E86)



AEPD-23436-O

Model NLN6761A
Nickel-Cadmium Battery
(Optional Rapid Charge
Model NLN6900A

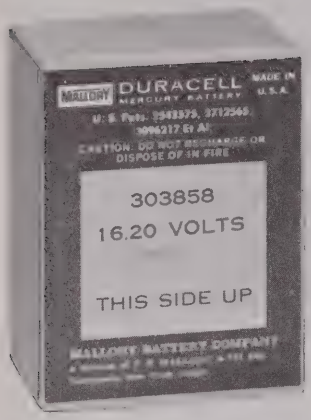
Model NMN6042B Speaker-Microphone
Coiled Cord Type
(MC13542)

OPTIONAL ACCESSORIES

SLIM-LINE HOUSING RADIOS (NOTE)	OMNI-HOUSING RADIOS (NOTE)	ACCESSORY NOMENCLATURE
NLN6683A	NLN6762A	Mercury Battery
NLN6899A	NLN6900A	Nickel-Cadmium Battery (Rapid Charge)
----	NLN8232A (6)	Nickel-Cadmium Battery (Current Limiting)
NLN6684A (5)	NLN6804A (5)	Single Unit Charger (Std Charge Rate)
NLN6774A	NLN6776A	Charger Insert Conversion (Converts charger for HT-200 radios to accept HT-220 radios)
NLN6685A (5)	NLN6756A (5)	Multiple Unit Charger (Std Charge Rate)
NLN6895A (5)	NLN6897A (5)	Single Unit Charger (Rapid Charge)
NLN6896B (5)	NLN6898B (5)	Multiple Unit Charger (Rapid Charge)
NLN6803A	NLN6845A	Carrying Case and Cover (for radio set equipped with rigid loop antenna; carrier squelch)
NLN6844A	NLN6846A	Carrying Case and Cover (for radio set equipped with rigid loop antenna; "Private-Line" Squelch)
NLN8241A	NLN8243A	Carrying Case and Cover; Carrier Squelch; Swivel Type
NLN8242A	NLN8244A	Carrying Case and Cover; "Private-Line; Swivel Type
NLN8254A	NLN8256A	Carrying Case and Strap; Carrier Squelch; Swivel Type
NLN8255A	NLN8257A	Carrying Case and Strap; "Private-Line"; Swivel Type
NLN6687A	NLN6780A	Lavalier and Safety Lanyard
NLN6731A	NLN6731A	Chest Pack, Black
NAD6213A	NAD6215A	Antenna, Rigid Loop
NAD6221A	NAD6221A	Antenna, Heliflex (136-142 MHz)
NAD6222A	NAD6222A	Antenna, Heliflex (142-150.8 MHz)
NAD6219A	NAD6219A	Antenna, Heliflex (150.8-162 MHz)
NAD6220A	NAD6220A	Antenna, Heliflex (162-174 MHz)
NLN6691A (1)	NLN6892A (1)	Vehicular Charger
NKD6006A	NKD6006A	Vehicular Charger Antenna Adapter
NLN6000B	NKD6000B	Antenna Input Adapter Cable (HT-220 to Vehicular Antenna)
NKD6001B	NKD6001B	Tune-Up Cable
NEN6072B	NEN6072B	Test Fixture
NLN6675A	NLN6770A	Back Cover, with Clip
NLN6679A	NLN6771A	Back Cover, with Clip ("Private-Line")
----	NLN6886A	Back Cover, with Clip (Universal Carrier Squelch)
----	NLN6887A	Back Cover, with Clip (Universal "Private-Line")
NLN6795A	----	Carrying Case for Spare Battery
NLN6042A	NLN6042A	Belt, black (fits radio, spare battery case and belt clip)
NLN6349A	NLN6349A	Carrying Strap black (for radio carrying case)
NMN6041B	NMN6041B (2)	Speaker/Microphone, Straight Cord Type
----	NMN6048B (3)	Speaker/Microphone, Straight Cord Type
NMN6050A (4)	NMN6050A (4)	Headset and Microphone, Safety Helmet Type
NMN6051A (4)	NMN6051A (4)	Headset and Microphone, Aircraft Type
NMN6056A (4)	NMN6056A (4)	Headset and Microphone, Earpiece Type
NLN6808A (4)	NLN6808A (4)	Push-to-Talk Unit, Remote Radio
----	NLN6889A (4)	Push-to-Talk Unit, Universal Radio

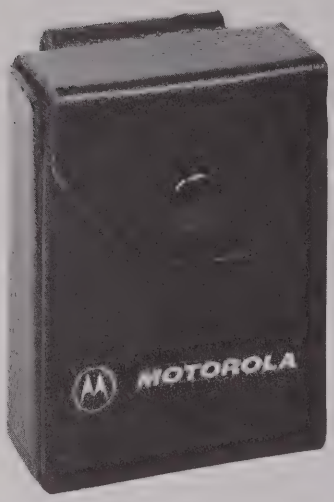
1. Following cables available for use with charger:
   NKN6149A 6-volt cable - NKN6150A 12-volt cable - NKN6151A Cigarette lighter cable
2. Remote Speaker/Microphone Models only.
3. Universal Speaker/Microphone Models only.
4. Headset/Microphone units for remote or universal Speaker/ Microphone Models only. Use NLN6808A push-to-talk unit with remote radio; use NLN6889A push-to-talk unit with universal radio.
5. Corresponding models are available for 220 VAC operation. Contact your local field representative for model nomenclature.
6. This battery must be used in units having the "Intrinsically Safe" Label.

OPTIONAL ACCESSORIES (CONT'D)

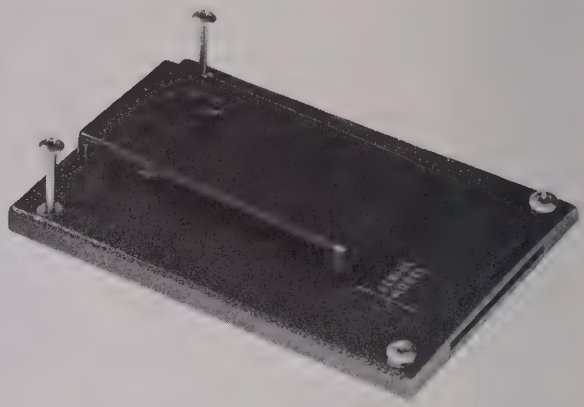


AEPD-23437-O

Model NLN6762A
Mercury Battery
(NLN6683A Similar)



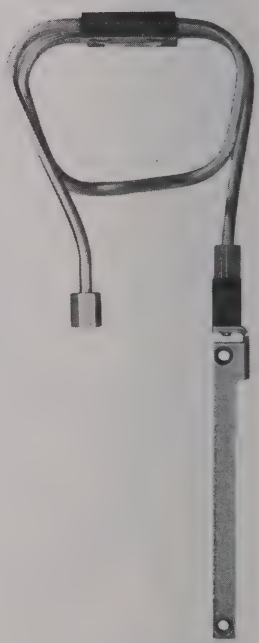
Model NLN6795A
Carrying Case for
Spare Battery
(CE2286-J92)



Model NLN6770A
Back Cover, with Clip
(Typical)
(CE69100-B17)

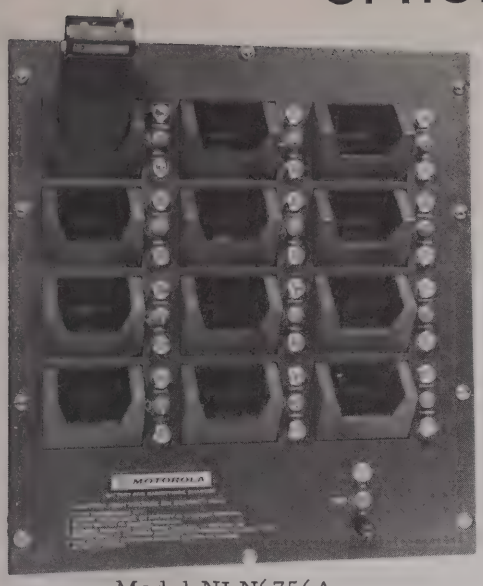
Model NLN6845A
Carrying Case and Strap
(Typical)
(CE69100-B15)

Model NLN6731A
Chest Pack (Black)
(CE2286-H92)

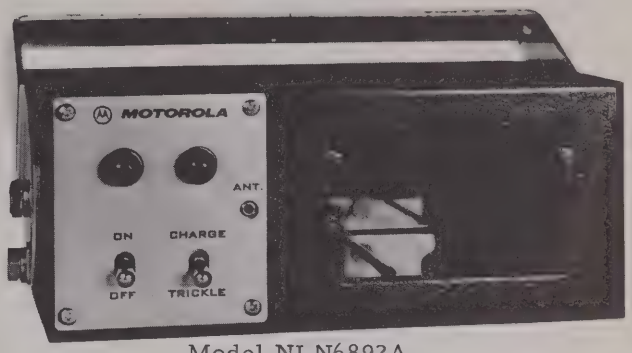


Model NAD6215A
Antenna, Rigid-loop
(NAD6213A Similar)
(CE2286-A86)

OPTIONAL ACCESSORIES (CONT'D)



Model NLN6756A
Multiple Unit Charger
(NLN6685A, NLN6896B,
NLN6898B Similar)
(CE69100-B18)

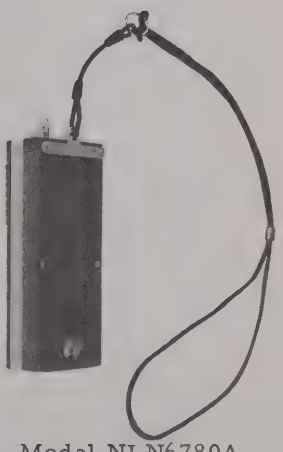


Model NLN6892A
Vehicular Charger
(NLN6691A Similar)
(CE69100-A26)

Model NLN6804A
Single Unit Charger
(NLN6684A, NLN6895A,
NLN6897A Similar)
(CE69100-B13)

NAD6219A, NAD6220A,
NAD6221A and NAD6222A
Heliflex Antenna
(MC13118)

Model NMN6041B
Speaker-Microphone
Straight Cord Type
(MC13543)



Model NLN6780A
Lavalier and Safety Lanyard
(NLN6687A Similar)
(CE69100-B11)

DESCRIPTION AND OPERATION

1. DESCRIPTION

a. General

This manual describes the completely transistorized, Slim-Line and Omni-Housing, H23FFN Series of Motorola "Handie-Talkie" FM radio sets. Each model is a portable two-way communications unit. The radios may be hand, shoulder-strap, or belt carried, and the remote speaker-microphone unit hand-held or attached to the shirt or lapel. Powered by mercury or nickel-cadmium batteries, the radio is capable of dependable two-way communication with any compatible FM radio set within range.

Miniaturized circuitry is utilized in the radio set and the introduction of integrated circuit modules assures the user of the latest in design features plus added dependability and long service life.

The unit is weatherproof and provides 1.8 watts rf output using the nickel-cadmium battery. Omni-Housing models use batteries which provide for a 10-10-80% duty cycle. The Slim-Line duty cycle is 5-5-90%. Accessories permit use of the unit in vehicles.

Various models are available, offering a combination of the following three features: carrier or dual squelch; internal, remote, or universal speaker-microphone facility; and one to six frequency capability. Carrier squelch models provide receiver quieting during no-signal periods. Dual squelch models offer both carrier squelch and "Private-Line" encoded squelch, but will be referred to as "Private-Line" models hereafter. Internal speaker-microphone models include self-contained speaker and microphone elements and push-to-talk switch. Remote speaker-microphone equipped models include a remote unit which houses these elements. Universal speaker-microphone models provide both an internal speaker and microphone and an external (remote) speaker and microphone, either of which may be employed at the user's option. All models provide a crystal-controlled, temperature compensated, operating frequency (or frequencies) for transmitting and receiving.

b. "Private-Line" Models

Motorola "Private-Line" radios are useful when operating under crowded channel conditions. Several networks may share the same carrier frequency in the same area with a minimum of interference when each network uses a different "Private-Line" tone frequency.

The transmitter portion consists essentially of a tone oscillator or encoder which is actuated when the push-to-talk button is pressed. The transmitter is then modulated by a continuous audio tone signal in addition to the voice message.

The receiver portion of the "Private-Line" squelch deck is essentially a decoder. With the "Private-Line" circuit "on", only properly coded messages will be heard at the speaker. Uncoded or improperly coded signals will be excluded.

c. Remote Speaker-Microphone Models

The remote unit includes speaker and microphone elements and push-to-talk switch. Through control of the transmit-receive switching relay in the radio set chassis, the push-to-talk switch permits remote control of the radio after initial operational adjustments (squelch, etc.) have been made.

d. Universal Speaker-Microphone Models

In these models a cable, terminated in a 4-pin plug, connects the external speaker-microphone unit, including push-to-talk switch, to the radio. When the plug is connected to the radio, a permanent magnet in the plug actuates a reed switch in the radio, transferring the radio from the internal speaker and microphone to the external speaker and microphone.

2. PRE-OPERATIONAL NOTES

Use care when unpacking and handling the "Handie-Talkie" radio set. Open the shipping carton and carefully remove all items. Check the contents to be sure that all items ordered have been included.

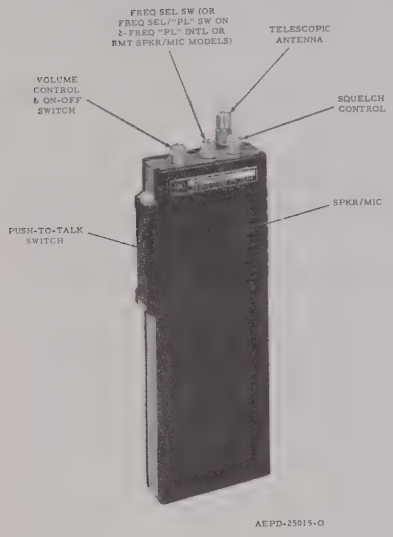
Inspect the equipment thoroughly as soon as possible after delivery. If any part of the equipment has been damaged in transit, report the extent of damage to the transportation company immediately.

IMPORTANT

This radio set contains a battery. Extended storage of the equipment will reduce the operating performance due

***IMPORTANT* (CONTD.)**

to reduction in battery voltage and possible deterioration of the battery. If equipment is to be stored for a long period of time, remove the battery and store it in a cool place.


FREQ SEL SW (OR FREQ SEL/"PL" SW ON 2-FREQ "PL" INTL OR RMT SPKR/MIC MODELS)
TELESCOPIC ANTENNA
VOLUME CONTROL & ON-OFF SWITCH
SQUELCH CONTROL
SPKR/MIC
PUSH-TO-TALK SWITCH
AEPD-25015-O

Typical Control Locations
(Internal Spkr/Mic, 2-Freq. Model shown)

Typical Control Locations
(Remote Spkr/Mic. Carrier Squelch, 3 to 6-Freq. Model shown)

Typical Control Locations
(Universal Spkr/Mic. "PL" Squelch 2 to 6-Freq. Model shown)

3. OPERATION

a. To Turn On

Turn the volume control in a clockwise direction until a "click" is heard. This places the unit in operational standby condition.

b. To Adjust Receiver Audio Volume

With a signal being received, turn the squelch control fully counterclockwise. In "Private-Line" ("PL") models, turn the "PL" ON-OFF switch to the OFF position (in two-frequency "PL" models, either F1 "PL" OFF or F2 "PL" OFF may be selected). Adjust the OFF-VOL control until the desired volume level is obtained at the speaker.

c. To Adjust the Squelch Control

Turn the SQUELCH control fully counterclockwise. In "PL" models, turn the "PL" ON-OFF switch to the OFF position (in two-frequency models, either F1 "PL" OFF or F2 "PL" OFF may be selected). With no signal being received, turn the SQUELCH control clockwise until the noise coming from the speaker just cuts out (squelches). The receiver is now set to "threshold" squelch. On "PL" models only, with the "PL" switch ON, the SQUELCH control can be turned fully counterclockwise to insure best sensitivity to incoming calls; however, the radio is susceptible to shock falsing when this is done.

d. To Monitor

With non-"PL" models, to monitor all on-frequency transmissions, turn the unit on and adjust the OFF-VOL and SQUELCH controls to the proper levels.

With "PL" models, to monitor all on-frequency transmissions, place the "PL" ON-OFF control in the OFF position and adjust the OFF-VOL and SQUELCH controls to the proper levels. To monitor only transmissions with the proper "PL" code, place the "PL" ON-OFF control in the ON position.

The antenna should be extended for maximum sensitivity. For short range operation, reception can be obtained with the antenna retracted or partially retracted.

e. To Transmit

NOTE

Listen for a clear channel before transmitting to insure non-interference with others using the same channel. On "PL" models, the "PL" ON-OFF switch must be set in the OFF position in order to do this.

Holding the radio set or remote unit, with the speaker/microphone grille approximately one to two inches from the lips, press the push-to-talk switch firmly, keeping it depressed. Speak in a natural tone of voice directly into the grille. For best results, speak slowly and distinctly.

f. To Select An Operating Frequency (Models with Two or More Frequencies)

Use the frequency selector switch to select any one of two to six operating frequencies, depending on model.

g. To Turn Off

To turn the radio off, turn the OFF-VOL control in the counterclockwise direction until a "click" is heard.

h. Storage

Battery considerations must be made when contemplating radio storage. If the radio set is equipped with a mercury battery, the battery must be removed before storing the set for a long period of time. If equipped with a nickel-cadmium battery, refer to the battery storage information which follows.

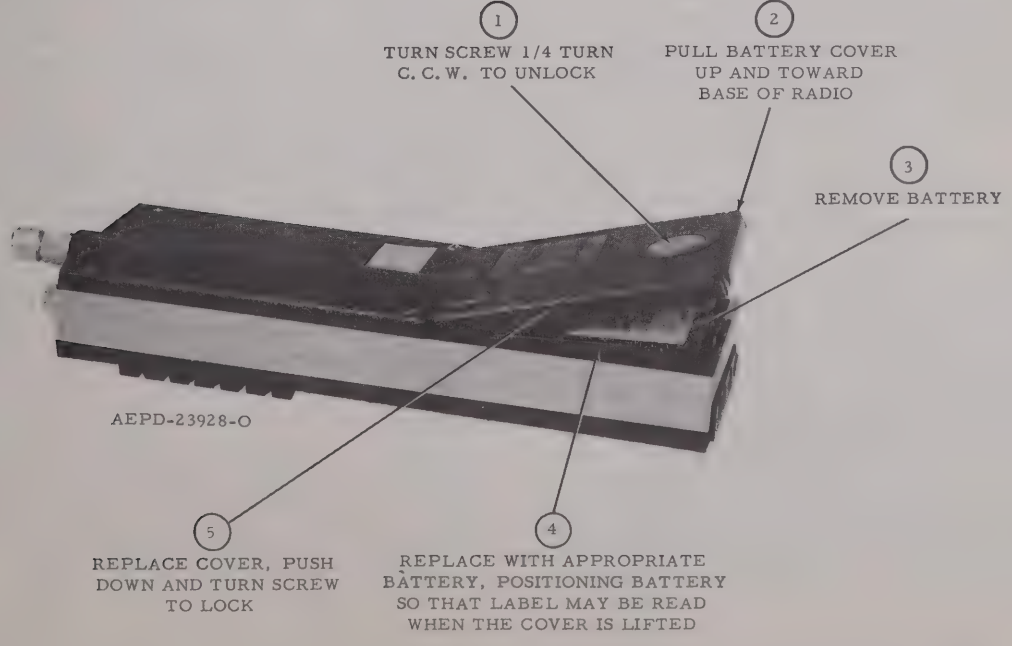
BATTERY REPLACEMENT AND CHARGING

1. BATTERY REPLACEMENT PROCEDURE

Follow the steps shown below.

WARNING

Do NOT discard batteries in fire as they may explode.


1
TURN SCREW 1/4 TURN C. C. W. TO UNLOCK
2
PULL BATTERY COVER UP AND TOWARD BASE OF RADIO
3
REMOVE BATTERY
AEPD-23928-O
5
REPLACE COVER, PUSH DOWN AND TURN SCREW TO LOCK
4
REPLACE WITH APPROPRIATE BATTERY, POSITIONING BATTERY SO THAT LABEL MAY BE READ WHEN THE COVER IS LIFTED

2. NICKEL-CADMIUM BATTERY KITS

The NLN6682A and NLN6761A Nickel-Cadmium Battery Kits are the rechargeable power sources normally supplied for the Slim-Line and Omni-Housing H23FFN Series "Handie-Talkie" FM Radios, respectively. The NLN6682A and NLN6761A Nickel-Cadmium Battery Kits are completely interchangeable with the NLN6683A and NLN6762A Mercury Battery Kits respectively except that the mercury batteries cannot be recharged.

Each nickel-cadmium battery consists of 12 hermetically sealed cells connected in series to provide a nominal 15 volt dc output at 225 mah (NLN6682A) or 450 mah (NLN6761A). The cells are enclosed in a molded plastic case.

a. Characteristics

The voltage of a nickel-cadmium battery remains approximately constant under load until the battery approaches the discharged condition. At this time, a marked decrease in the voltage occurs and the discharged condition (0.92 v per cell) is reached abruptly. Metering to determine the state of charge of this type of battery is difficult and is not normally performed. A general characteristic of all rechargeable batteries in storage is self discharge. If the battery is used after unknown periods of storage, it is recommended that it be charged for 16 hours at the full charging rate using an approved battery charger, and then trickle charged until need for the battery arises. The Model NLN6684A Single Unit or NLN6685A Multiple Unit Battery Charger provides the specified charge rate for the NLN6682A Battery; the Model NLN6804A Single Unit or NLN6756A Multiple Unit Battery Charger provides for the NLN6761A Battery.

CAUTION

Avoid accidental short circuits. Sustained high rate discharges will damage the battery.

b. Maintenance

The battery cells will never require addition of electrolyte. The only maintenance required is recharging the battery and keeping the contacts clean.

The Motorola Model NLN6844A or NLN6685A Battery Charger is recommended for charging the NLN6682A Battery; the Motorola Model NLN6804A or NLN6756A Battery Charger for charging the NLN6761A Battery. The use of other chargers, unless approved, will void the battery guarantee and may result in permanent damage to the battery. Follow the charging instructions which accompany the charger.

NOTE

In addition to the nickel-cadmium batteries and their associated chargers discussed here, rapid charge batteries and battery chargers (full charge in one hour) are available as optional items. See the optional accessories table in the front matter of this manual, and the individual battery and battery charger sections at the end of this manual.

c. Storage

The battery may be stored at room temperature in any state of charge without damage. For storage periods in excess of six months, it is recommended that the battery be kept in a discharged state. As previously stated, however, the battery is subject to self discharge and should be recharged after extended storage.

d. Warranty

(1) Service Life Warranty

Any battery failing due to defects within one year will be replaced without additional cost. The battery is considered defective if:

(a) It fails to deliver 80% of its rated capacity.

(b) It develops apparent leakage.

NOTE

Capacity for the purposes of determining liability under the provisions of this paragraph shall be determined as follows:

1 The battery shall first be completely discharged ghrough a 215 ohm resistive load until its load voltage is between 9.0 and 12.0 volts.

2 It shall be charged for 16 hours using an approved charger (NLN6684A or NLN6685A for NLN6682A Battery, NLN6804A or NLN6756A for NLN6761A Battery, or equivalent models) at the full charge rate.

3 It shall then be discharged at 68°F through a 65 ohm (NLN6682A or 32.5 ohm (NLN6761A) resistive load, as applicable to its 12 volt discharge state.

4 The time required to reach the 12 volt discharge state must esceed 60 minutes for 100% capacity.

(2) Battery Replacement

If at any time during the service period, the battery fails to deliver 80% of rated capacity (48 minutes) when determined as specified above, consult only your nearest Motorola Service Representative for further instructions.

(3) Limitations to Liability

The Manufacturer's Guarantee becomes VOID if:

(a) Equipment other than that approved by the manufacturer is used to charge the batteries.

(b) Charging is done at temperatures greater than 122°F without proper instructions from the manufacturer.

(c) Batteries are used in equipment or for other services for which they were not intended.

DESCRIPTION OF ITEMS

1. GENERAL

Descriptions of the items listed in the model chart and the required accessores table are provided in this section.

2. DESCRIPTION

a. Chassis Frame

The Chassis Frame includes the transmitter receiver circuitry, and where applicable the "Private-Line" circuitry. The transmitter - receiver circuitry is mounted on the main circuit board. The "PL" circuitry is affixed to a small circuit board which is slot-mounted between the main circuit board and the battery compartment. The metal frame, remote speaker/microphone connector (universal and remote spkr/mic models only), OFF-VOL control, frequency selector switch (two-frequency, carrier and "PL" squelch, internal and remote speaker/microphone models only), "PL" ON-OFF switch ("PL" models only), SQUELCH control, antenna receptacle, and receiver i-f crystal are also part of the chassis frame. "PL" chassis are longer than their carrier squelch (C. S.) counterparts in order to house the added "PL" circuit board. In two-frequency, internal and remote speaker/microphone, "PL" models, a four-position rotary switch is used to select the "PL" ON or "PL" OFF positions of each frequency. In other models, the "PL" ON-OFF switch is a two-position toggle switch.

b. Transmitter and Receiver Control Crystals

These crystals are the frequency determining elements for the transmitter and receiver.

c. "Vibrasponder" Resonant Reed ("PL" Models Only)

This is the frequency controlling element in the "PL" circuit. It is an electro-mechanical device made to vibrate at a specific frequency in the frequency range below 200 Hz.

d. Battery Cover

The battery cover is located below the back cover of the radio. It is identified by the large slotted fastener used to hold it (and battery) in place. The Slim-Line cover is thicker than the Omni-Housing cover.

e. Back Cover

The back cover includes the four Phillips-head screws with washers. The coil identification label is located inside of the back cover. Slim-Line model back covers have a protuberance to provide an inside channel for a collapsible antenna; Omni-Housing covers are without the protuberance. "PL" cover variations are longer than their C. S. counterparts in order to accommodate a longer chassis frame.

f. Front Cover

The front cover includes the speaker and microphone (internal or universal spkr/mic models only), battery contacts, fuse and associated wiring. Omni-Housing model front covers have a longer spring latch than the Slim-Line covers in order to accommodate an extension sleeve. "PL" cover variations are longer than their C. S. counterparts.

g. Extension Sleeve (Omni-Housing Models Only)

This sleeve extends the chassis frame to allow space for such items as a thicker battery and a multi-frequency board. The sleeve includes a molded-in antenna receptacle. The "PL" model sleeve is longer than the C. S. sleeve.

h. Tuning Tool Kit

Tuning tools are used while performing the transmitter and receiver alignment procedure. A metallic and a non-metallic tool are provided.

i. Nameplate Kit

This kit consists of nameplates which provide FCC type, serial number, model number, and frequency information.

j. Coil Identification Label

The coil identification label provides tuning coil, interstage transformer, and metering point locations needed for transmitter-receiver alignment and servicing. The label is located inside the back cover.

k. Nickel-Cadmium Battery

The battery is the rechargeable power source for the radio. Further information on nickel-cadmium batteries can be found in the preceding section and in individual sections at the end of this section.

l. Telescoping Antenna

The five-section antenna is constructed of stainless steel tubing. A knurled fastening ferrule attaches the antenna to the radio. The antenna is used in the fully extended position for maximum reception and transmission.

m. External Speaker/Microphone (Remote and Universal Spkr/Mic Models Only)

The external speaker/microphone permits two-way radio communication while the radio is carried on the person; i. e., carrying case fastened to user's belt or worn with shoulder strap. A rotatable clip on the back of the speaker/microphone housing permits the unit to be carried on the user's belt, shirt or shoulder strap when not in use.

n. Carrying Case and Cover

The carrying case and cover affords the best means of protecting and holding the radio when it is not in use. The case may be fastened to the user's belt. Omni-Housing model cases are thicker than Slim-Line cases, and "PL" variations are longer than C. S. counterparts.

o. Carrying Case and Strap

The carrying case and strap is similar to the above case and cover, except that the strap allows for access to the radio external controls while encased.

THEORY OF OPERATION

1. GENERAL

This series of "Handie-Talkie" FM radio sets consists of a crystal-controlled transmitter and receiver operating in the 136-174 MHz frequency range. The transmitter contains an audio section and an rf section. The audio section consists of a microphone, and an integrated circuit Instantaneous Deviation Control (I. D. C.) circuit. The rf section includes a crystal-controlled oscillator-varactor modulator, two-frequency tripler stages, a driver amplifier, and a final amplifier stage.

The receiver is a dual conversion, superheterodyne type of unit, consisting of an rf amplifier, two oscillators, two mixers, a 455 kHz integrated circuit i-f amplifier, a limiter stage, a discriminator stage, a squelch circuit, an audio circuit, and a speaker.

"Private-Line" Models include additional stages, some of which are shared by both transmitter and receiver.

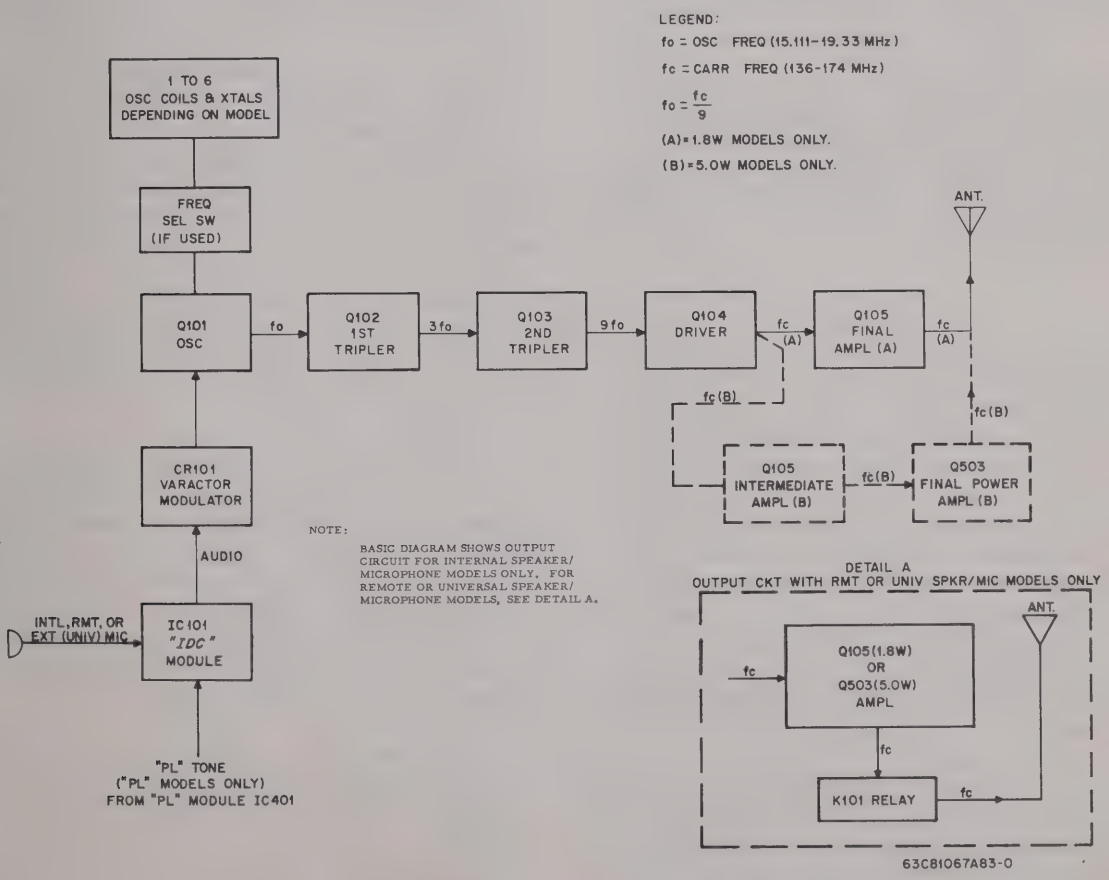
2. CIRCUIT THEORY

a. Transmitter

The microphone produces a low level audio output which is capacitively coupled to the input of the integrated circuit module IC101. This module provides the functions of amplification, clippling, and audio shaping. It also contains a regulated voltage source which helps to maintain the frequency stability of the oscillator. The Instantaneous Deviation Control (I. D. C.) circuitry is included in the module. The audio signal appearing at the output of IC101 has been amplified, pre-emphasized from 300-3000 Hz at a 6 db/octave rate, and attenuated if its frequency is above 3000 Hz. The audio "splatter" filter, including R180 through R183 and C181 through C183, provides attenuation of all audio frequencies above 3000 Hz. The audio signal from the integrated module IC101 is capacitively coupled to the oscillator-modulator stage.

Oscillator stage Q101 is a crystal-controlled series resonant circuit, with varactor CR101 in series with the frequency control crystal. The frequency adjustment (warping) coil, which permits setting of the operating frequency, is also in series with the crystal. On multi-frequency models, additional coils each act in conjunction with their own frequency control crystals to determine their specific oscillator frequencies. The frequency selector switch is used to switch between operating frequencies, allowing transistor Q101 to serve as the oscillator for all frequencies.

Modulation of the transmitter is accomplished by applying the microphone generated audio output from the integrated circuit module IC101 (and on "PL" models, the "PL" tone output from the integrated circuit module IC401) to the varactor CR101 in the oscillator circuit. The combined audio and "PL" signal at the varactor varies the capacitance of the varactor which, in turn, results in a frequency shift of the oscillators frequency at an audio rate.



Transmitter Block Diagram

The output signal from oscillator Q101 is fed into the frequency multiplier stages Q102 and Q103 where it is multiplied 9 times to produce the desired carrier frequency. Without an input signal, a zero-biased class B frequency multiplier stage will not draw any emitter current. With drive present, the transistor draws current, which is monitored by measuring the dc voltage developed across Q102 first tripler collector resistor R106 (metering point M11). The second tripler stage Q103 likewise may be monitored by measuring the voltage developed across the second tripler emitter resistor R108 (metering point M12). Since the signal input level to the first tripler is very low, a small amount of forward bias is supplied to increase the gain of the stage.

After being multiplied, the rf signal is applied to the driver amplifier Q104. This stage provides the proper rf power to drive the final amplifier Q105 to the rated power output level. The circuit between the collector of Q105 and the antenna provides attenuation of carrier frequency harmonics and also functions as a load matching network to insure maximum transfer of rf to the antenna.

On remote and universal speaker/microphone models, relay K101 is used to switch the antenna rf input/output and battery voltage from transmitter to receiver. The relay is actuated by the push-to-talk switch located on the remote speaker/microphone.

b. Receiver

The rf signal from the antenna is coupled into rf amplifier Q1. On remote and universal speaker/microphone models, the rf signal is routed through relay K101 before being coupled into Q1. The amplified signal is then coupled into the first mixer Q3. The first oscillator Q2 is a crystal controlled series resonant type operating on the third overtone of crystal Y1. On multi-frequency models, the frequency selector switch determines the operating frequency. The third harmonic of the crystal frequency is injected into the first mixer where it is combined with the rf amplifier output to produce the high (or first) i-f frequency.

The first i-f signal is then coupled through the 16.8 MHz crystal filter into the second mixer Q5. In the second mixer stage, the first i-f signal and the second oscillator frequency are combined or mixed to produce the low (455 kHz) i-f frequency.

The low i-f passes through the 455 kHz ceramic filter into the integrated circuit module IC1. After being amplified by IC1, the i-f signal is coupled to the limiter Q6 where any amplitude modulation of the signal is removed. The limited signal is then fed to the discriminator stage (CR3, CR4) where the frequency variations of the incoming signal are translated into an audio signal, and this signal is then filtered and amplified further by Q7, Q12, Q14, Q15, and Q16.

The first stage in the receiver audio section is Q7 which is an active high-pass filter with unity gain in the pass band. At the cut-off frequency (approximately 300 Hz), the filter has a gain of approximately 5 db, and at the lower frequencies, the roll-off is 18 db/octave. At the output of the active filter is the receiver volume control.

From the volume control, the signal is fed into direct coupled audio stages Q12, Q14, Q15, and Q16. A dc feedback amplifier stage Q13 provides dc stability. From Q15, the audio signal is coupled to the speaker.

When the receiver is squelched, the squelch switch Q11 staurates and grounds the base of first audio amplifier Q12. This turns off Q12 which turns off audio driver Q14. With Q14 now off, the bases of Q15 and Q16 are at zero volts. This action sets the emitters of Q15 and Q16 at zero volts which back biases the dc feedback amplifier Q13. Thus, when the receiver is in the squelched mode, all of the audio transistors are turned off.

The squelch circuitry mutes the receiver during the intervals between messages, thus preventing the normal no-signal noise from being heard at the speaker. The squelch circuitry takes noise from the discriminator stage through a high-pass filter, amplifies it, and converts it to a dc voltage which operates the squelch switch stage Q11.

When the receiver senses an on-channel signal the noise decreases, thus tending to reduce the dc voltage at the squelch switch stage input. The squelch switch opens and this turns on the audio stages. On "PL" models, the proper "PL" tone must also be present to open the squelch switch.

c. "Private-Line" Circuit

(1) Receiver Portion

The "PL" decoder and receiver are interfaced in an "AND" gate logic scheme requiring a simultaneous input from both the decoder and the receiver before the receiver audio can turn on. This type of operation affords the user two advantages not previously available:

(a) A squelch tail duration independent of reed decay time.

(b) Shock-falsing is eliminated as long as the receiver is squelched and no carrier is on the air.

Recovered audio from the discriminator is filtered to suppress the high frequency voice component and pass the low frequency (below 200 Hz) "PL" tone. The tone is coupled into the "PL" module IC401 at pin 8. The tone is amplified, coupled externally from pin 4 to pin 10 of the module and further amplified before being applied to the primary of the "Vibrasponder" resonant reed. If the tone is of the proper frequency, it is coupled electromechanically to the reed secondary, then back into the module at pin 11 for further amplification and detection. With the proper tone, the voltage at pin 13 drops to zero.

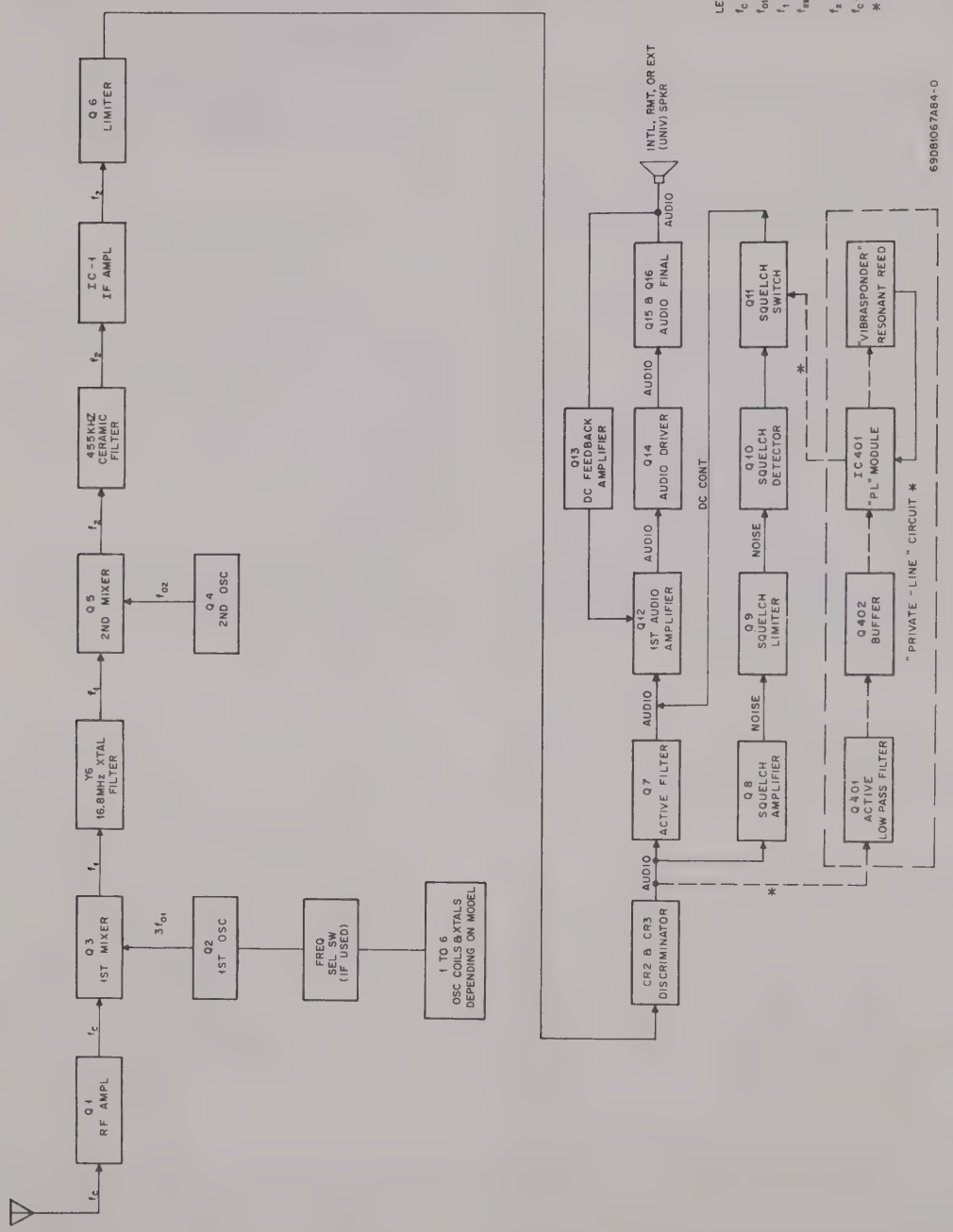
Electrically, the "AND" gate logic results from the fact that both Q10 and the "PL" module IC401 (pin 13) apply bias to Q11 during standby operation. Q11 turns off, and consequently the audio turns on, only when both base bias sources turn off. This only occurs when the proper "PL" tone and an rf carrier are present.

The receiver portion of the "PL" circuit is disabled by setting the "PL" switch to the OFF position. With the switch set to OFF, pin 12 of IC401 is grounded (1K ohms from ground on two-frequency, internal or remote speaker/microphone models) to simulate reception of the proper "PL" tone. The receiver then functions as a standard noise operated, carrier squelch receiver.

(2) Transmitter Portion

A feedback loop within the "PL" module IC401 is established when voltage from the transmitter is applied to pin 16. The frequency of oscillation is controlled by the "Vibrasponder" resonant reed and the "PL" tone output is taken from pin 3 of the "PL" module and applied to pin 1 of the transmitter I. D. C. module. The amount of "PL" tone deviation is controlled by R415.

Unlike the receiver portion of the "PL" circuit, the transmitter portion cannot be disabled. The "PL" tone output is always present during transmitting.


Q1 RF AMPL
Q3 1ST MIXER
Q2 1ST OSC
FREQ SEL SW (IF USED)
1 TO 6 OSC COILS & XTALS DEPENDING ON MODEL
Y6 16.8MHz XTAL FILTER
Q5 2ND MIXER
Q4 2ND OSC
455KHZ CERAMIC FILTER
IC-1 IF AMPL
Q6 LIMITER
CR2 & CR3 DISCRIMINATOR
Q7 ACTIVE FILTER
Q8 SQUELCH AMPLIFIER
Q9 SQUELCH LIMITER
Q10 SQUELCH DETECTOR
Q11 SQUELCH SWITCH
Q12 1ST AUDIO AMPLIFIER
Q13 DC FEEDBACK AMPLIFIER
Q14 AUDIO DRIVER
Q15 & Q16 AUDIO FINAL
INTL, RMT, OR EXT (UNIV) SPKR
Q401 ACTIVE LOW PASS FILTER
Q402 BUFFER
IC401 "PL" MODULE
"VIBRASPONDER" RESONANT REED
"PRIVATE-LINE" CIRCUIT *
AUDIO
NOISE
DC CONT
LEGEND:
f_c = CARRIER FREQUENCY = 136–174 MHz
f_{01} = 1ST OSCILLATOR FREQUENCY = 39.733–52.4 MHz
f_1 = HI IF FREQUENCY = 16.8 MHz
f_{02} = 2ND OSCILLATOR FREQUENCY = 16.345 OR 17.255 MHz (SEE RCVR SCHEMATIC)
f_2 = LO IF FREQUENCY = 455 kHz
$f_c = 3f_{01} + f_1$
* = "PRIVATE-LINE" MODELS ONLY
69D81067A84-O

Receiver Block Diagram

MAINTENANCE

1. TEST EQUIPMENT

All the required test equipment needed for aligning and testing the "Handie-Talkie" Radio described in this manual is listed in the following table. The listed items or their equivalents may be used.

TABLE OF RECOMMENDED TEST EQUIPMENT

TYPE OF EQUIPMENT OR TYPE OF MEASUREMENTS	EQUIPMENT CHARACTERISTICS	RECOMMENDED TYPE
All	Select battery operated test equipment where available, for versatility.	See your Motorola sales representative before ordering test equipment. He will analyze your requirements and help you select your latest available equipment to suit your individual needs. He can also advise you of new servicing equipment which becomes available after the printing of this manual.
Power Supply for Bench Testing	Current Ranges 0-200 & 0-400 mA; 0-1 & 0-2 Amps DC Volts 1-18 Adjustable	Motorola Model TEK 23 Filtered DC Power Supplies, or any other dc supply or battery bank with similar ratings.
Test Jig	Holds Omni Housing or Slim-Line HT Radios with metering switch selection	Motorola Model TEK 43 Test Jig
Transmitter Frequency Measurement	Frequency - 25-500 MHz Accuracy - ±.00005% or better	Any of the following items of Motorola Test Equipment Model S1327A Service Monitor Model S1315A Frequency Calibrator Model S1324A Digital Frequency Meter Model S1325A Digital Frequency and Deviation Meter Model S1317A or S1322A Digital Frequency/Period Counter
Transmitter Deviation Measurement	Peak reading type for voice or sinusoidal wave; scales for accurate reading of ±5 kHz deviation (and ±1 kHz deviation for "Private-Line" models)	Any of the following items of Motorola Test Equipment Model S1327A Service Monitor Model S1326A Frequency Calibrator and Deviation Meter Model S1323A Deviation Meter Model S1325A Digital Frequency and Deviation Meter Model S1059A Portable Test
Transmitter Power Output Measurement	25-500 MHz; 50 ohms, 0-3, 0-15, 0-50, 0-150 watts 50-ohm dummy load; up to 20 watts	Motorola T1024A Motorola Model T1024 R.F. Termination Wattmeter Motorola Model T1032A RF Load Resistor Motorola Model S1327A Service Monitor with SLN1009A Wattmeter Plug-In Module
RF Signal Generator for receiver testing	25-500 MHz; FM; high-stability- (±.0002% or better); adjustable output 0 to 1000 microvolts	Motorola Model S1327A Service Monitor Motorola S1318A Series Solid-State FM Signal Generator
Audio Voltage Measurements	High impedance (10 megohm); dBm scale.	Motorola Model S1053C Solid-State AC Voltmeter
Audio Signal Generator for audio circuit testing in receiver and transmitter	Variable amplitude 0 to 1 volt; 100 Hz tone (300 to 3000 Hz preferred); sinusoidal wave	Motorola Model S1067A Solid-State Audio Oscillator Motorola Model TEK-1A Tone Oscillator Motorola S1327A Service Monitor
DC Voltage Measurements, Resistance Measurements, RF Voltage Measurements	High impedance (11 megohm) dc multimeter	Motorola Model S1063A Solid-State DC Multimeter with SLN6055A RF Probe Motorola Model T1048A Digital Multimeter
Waveform Measurements	Oscilloscope: Audio circuit measurements RF circuit measurements, at least 50 MHz bandwidth	Motorola Model T1038A General Purpose Oscilloscope. Motorola Model S1331A or S1332A Solid-State Oscilloscope. A very high quality instrument is required.
"Private-Line" tone injection for PL decoder circuit measurements	Audio frequency synthesizer; or "Private-Line" tone generator using "Vibrasender" Resonant Reed for frequency accuracy	Motorola Model S1333A Audio Synthesizer Motorola Model SLN6221A "Private-Line" Tone Generator
Selective Call tone injection for S.C. Decoder circuit measurements	Audio frequency synthesizer capable of generating two tone sequential signal; or two tone sequential generator using "Vibrasender" Resonant Reeds for frequency accuracy.	Motorola Model S1333A Audio Synthesizer Motorola Model TEK 34A Tone Generator

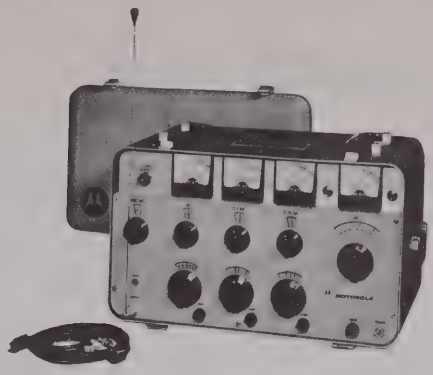
EPF-420-O

NOTE

The NKD6001B Tune-Up Cable must be used when aligning transmitter into a 50 ohm wattmeter in order to simulate the actual impedance of the antenna. Reduced radiated power will result if the radio is tuned directly into the wattmeter without the tune-up cable.

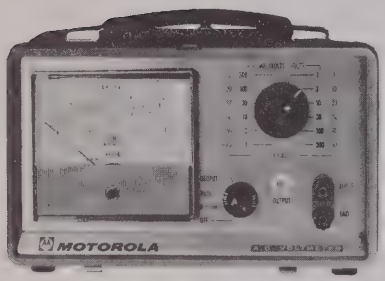
RECOMMENDED TEST EQUIPMENT

S1056A-S1059A
Test Set

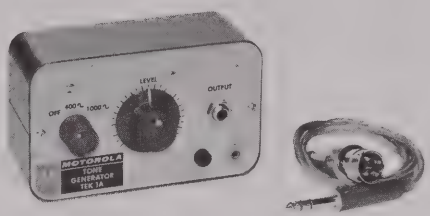


T1021B
Frequency Meter

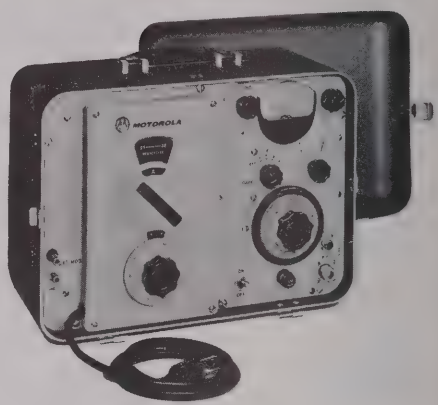
S1052B
DC Multimeter



S1051C
Transistorized AC
Voltmeter

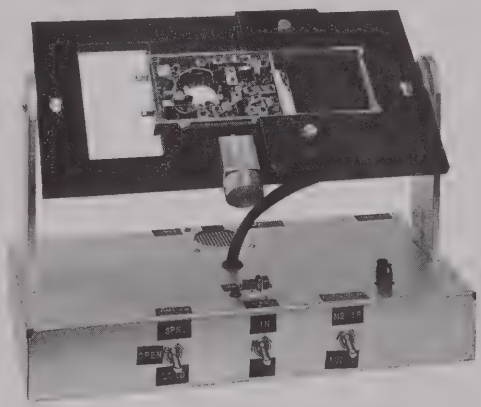


TEK-1A
Transistorized Tone
Generator

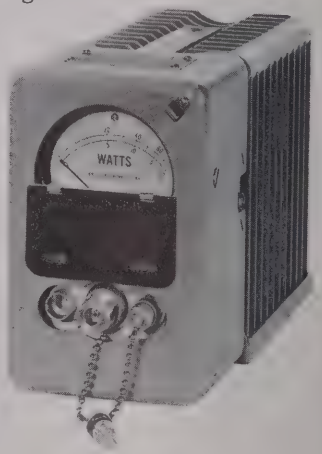


T1034C
FM Signal Generator

S1301
Precision Wide-Band
Oscilloscope

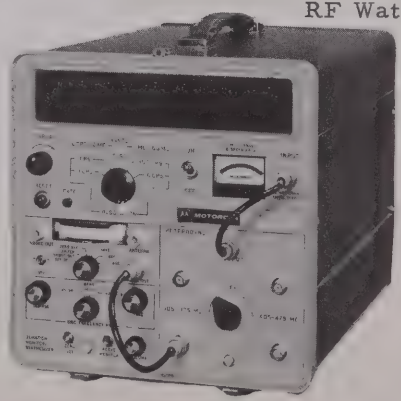


NEN6072A
Test Fixture



Model 61
RF Wattmeter

TEK-23
Power Supply



S1078B Digital Frequency Meter with
Deviation Monitor/Synthesizer

2. TEST PROCEDURE

When a radio requires servicing, use the following procedures to localize the fault.

a. Check Batteries

The first step in localizing the trouble is to check the battery voltage under load. With the transmitter turned on (keyed), check the battery voltage. A convenient way to do this is to remove the battery cover and radio compartment cover as shown in the DISASSEMBLY PROCEDURES. Place the voltmeter ground lead on the metal frame and measure the voltage at the transmitter B+ input while the transmitter is keyed. The measured loaded voltage should be not less than 11 volts for the nickel-cadmium batteries, and not less than 10 volts for the Mercury battery. Even though the transmitter may operate at a lower voltage, its operation would be marginal and for only a short additional period of time. The recommended procedure is to replace, or recharge, the batteries if the voltage is below that mentioned above when under load. Refer to the BATTERY REPLACEMENT AND CHARGING section of this manual for additional information.

NOTE

Only the nickel-cadmium batteries are rechargeable.

b. Check Overall Transmitter Operation

If the battery voltage is sufficient, check the overall performance of the transmitter. A good overall check of the transmitter is the rf power output measurement. This one check indicates the proper operation of all the transmitter stages (oscillator, frequency multipliers, driver and final amplifier) with the exception of the modulator and audio circuitry. A properly tuned and operating transmitter will produce at least 1.8 w rf output into a 50-ohm load with a dc input of 15 volts. It may be necessary to retune the output circuits slightly to match the 50-ohm load. This measurement must be made using a 50-ohm wattmeter connected to one end of the NKD6001B Tune-up Cable with the other end connected to the antenna opening of the radio set.

For further details, refer to the transmitter alignment procedure. If the power output is less than 1.8 watt with a dc input voltage of 15 volts, further checking is required. Refer to Transmitter Troubleshooting Chart.

c. Check Overall Receiver Operation

(1) 20 DB Quieting Sensitivity Check

A good overall check of the receiver operation is the 20 db quieting sensitivity measurement. This check will indicate that the receiver has sufficient gain and that all the included circuitry is working properly. The quieting signal is that rf signal input necessary to reduce the audio output at the speaker by 20 decibels. The measurement should be made in the absence of extraneous signals. Sinoe the receiver squelch circuitry removes the noise from the speaker, the squelch control should be set to its maximum ccw position while making this measurement. (On "PL" models, turn off the "PL" switch).

The actual measurement is made by observing the noise voltage at the speaker (metering point M5 on the chassis is more convenient on remote speaker/microphone models) on an ac voltmeter with no rf signal received at the antenna. Sufficient carrier signal from a recommended signal generator is then introduced via the antenna opening using the NKD6001B to reduce the noise output voltage to 1/10 of the previous reading. If all circuitry is operating properly, the quieting signal should be 0.35 microvolt or less.

(2) Squelch Check

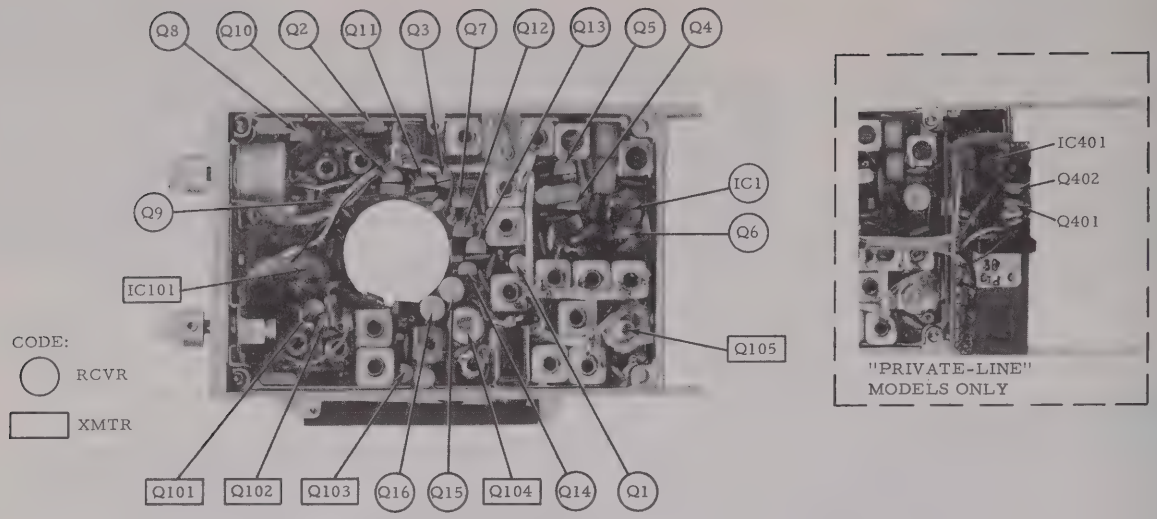
With no rf input signal, (and with the "PL" switch off in "PL" models) set the squelch control until the speaker noise just cuts out (threshold squelch). Sufficient carrier signal from a recommended signal generator is then introduced until speaker noise is just heard. The signal level at which the squelch begins to open should be less than one-half the 20 db quieting sensitivity voltage measured in subparagraph (1).

(3) Audio Check

This procedure will test the audio circuits exclusive of the squelch circuitry. Refer to the AUDIO AMPLIFIER MEASUREMENTS CHART, which appears later in this manual, for typical measurements and procedures.

(4) "PL" Check ("PL" Models Only)

Place "PL" control in ON position, and introduce same level of signal as in Step (3),



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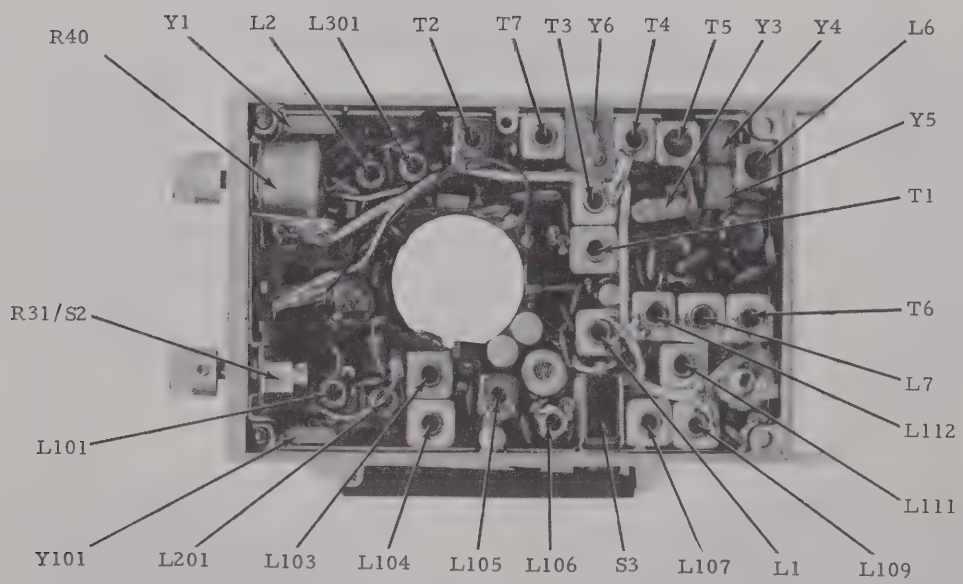
CARR SQUELCH, INTL SPKR/MIC, 1-FREQ RADIO SHOWN

Transistor Location Detail



CARR SQUELCH, INTL SPKR/MIC, 1-FREQ RADIO SHOWN

AEPD-25090-A

Parts Location Detail

without "PL" modulation. No audio should be heard. Next, modulate carrier with the proper "PL" tone and a 1000-cycle tone. This should cause the receiver audio to open and allow the 1000-cycle tone to be heard.

3. DISASSEMBLY PROCEDURE

To gain access to the component side of the chassis, follow the applicable disassembly procedure illustration. To reassemble the radio, reverse the steps listed in the illustration.

4. DISASSEMBLY PROCEDURE (ADVANCED)

Normally the radio set need not be disassembled further than outlined in the preceding disassembly procedure. However, should it become necessary to replace or repair the push-to-talk switch, volume control, on-off switch, squelch control, or frequency selector switch, the following procedures should be followed to insure that the radio is not damaged or otherwise rendered inoperative. Refer to your applicable exploded view provided later in this manual.

NOTE

When removing any components, be careful to route leads as close as possible to original routing. It is suggested that all leads be tagged or colors written down so proper reassembly is facilitated.

To replace or repair the push-to-talk switch, volume control, on-off switch, squelch control, or frequency selector switch (if included), remove the parts shown in exploded view in numerical order. All these parts must be removed when it is desired to remove the radio set board from the radio set frame assembly.

The control knobs are fastened with bristol type screws. The special nuts holding the volume control, squelch control, and frequency selector switch can be removed with an ST-635 Spanner Wrench (available on separate order).

To facilitate parts ordering, use the exploded view (or views), provided later in this manual, and its associated table of mechanical parts and disassemblies.

a. Microphone Replacement

If the microphone or any part(s) associated with it are faulty, replace the complete front cover assembly. Do not remove the microphone bracket (located under the speaker) or any parts constrained by it (including the grille cloth.

b. Speaker Replacement

Remove the front cover from the radio set by first removing the battery compartment cover and then the radio compartment cover (Steps 2 and 3 of Typical Disassembly Procedures. Loosen the two bushings at the corners of the component board closest to the control end of the radio set. (In "Private-Line" models, loosen two additional bushings which are just above the "Private-Line" circuit boards; see "Private-Line" Disassembly illustrations on the following pages.) Pull out the black (B-) lead, the red (B+) lead, the blue (speaker) lead, and the white (microphone) lead. Remove the small cable clamp holding the four leads to the cover. Using a diagonal cutting pliers, cut the toothed retaining washers holding the speaker to the front cover. If attempts are made to remove the retaining washers without cutting them, it is possible that the cover studs will be broken off or damaged. When replacing the speaker, make sure that the speaker insulator (over the back of the speaker) is replaced.

SPEAKER REPLACEMENT PARTS	
NAME	MOTOROLA PART NO.
Speaker Insulator (1)	14B83863B03
Washer, Spring (2)	4K840914
Washer, Retaining (2)	4K848065
Clamp, Wire (1)	42B84809H01
Screw, for Clamp (1)	3S135347

5. RECEIVER TROUBLESHOOTING CHART

The receiver troubleshooting chart will help isolate troubles in the receiver portion of the radio set. Start at the top of the chart and make the tests as shown. Most usual malfunctions will respond to the systematic approach to troubleshooting.

6. TRANSMITTER TROUBLESHOOTING CHART

The transmitter troubleshooting chart will help isolate circuit malfunctions in the transmitter portion of the radio set. Follow the same procedure as in troubleshooting the receiver portion of the radio set.

7. RECEIVER STAGE ANALYSIS

The information contained in the following paragraphs will aid the serviceman in localizing the trouble to a particular stage.

a. Test Points

The test points on the printed circuitry are color coded for easy location. The locations of these test points may be seen on the alignment chart, the schematic diagram, and the printed circuit board details at the back of this manual.

b. Stage Measurements Charts

In addition to the 20 db quieting sensitivity measurement, all stage gain measurements can be checked against those shown in the following RF AND IF STAGE MEASUREMENTS CHART and AUDIO AMPLIFIER MEASUREMENTS CHART.

8. TRANSMITTER SERVICE NOTES

The following information will aid the serviceman in troubleshooting the transmitter.

a. Metering Points

The test points on the printed circuit board are supplied for ease in checking. These points are indicated on the schematic diagram, wiring diagrams, and the photograph on the alignment procedure. The chart on the alignment procedure provides nominal voltage readings corresponding to these test points for a fully tuned transmitter with 15 volts dc input.

b. DC Voltage Measurements

If the rf power output is lower than normal for fully tuned transmitter, the dc voltages on the printed circuit board should be checked. These voltages should all be referenced to ground.

CAUTION

When checking a transistor, either in or out of the circuit, do not use an ohmmeter having more than 1.5 volts dc appearing across the test leads or an ohms scale of less than x 100.

The transistor is a dependable component and is not subjected to replacement as frequently as tubes. Therefore, the serviceman is cautioned not to replace transistors before a thorough check is made. The transistor terminal voltages should be checked first. If these voltages are not reasonably close to those specified, the associated components should be checked. A low impedance meter should not be used for measurement. If all dc voltages are correct, the signal should be traced through the circuit to show any possibility of breaks in the signal path.

c. RF Signal Tracing

An rf probe attachment for dc multimeter may be used to good advantage in checking the transmitter. The presence of rf can be checked throughout the rf circuitry for continuity of signal path. This would include the oscillator, frequency multipliers, and the driver and final amplifier. When checking the presence of a signal in the rf stages, it is recommonded that the heavy signal flow line be followed as indicated on the schematic diagram.

d. Frequency Multipliers

Transistor frequency multipliers, or class B amplifiers in general, do not require forward biasing. Without signal drive, a zero-biased, class B frequency multiplier stage will not draw any emitter current. With drive present, the transistor will draw current and this current is monitored best by measuring the dc voltage developed across the emitter or collector resistor. The 1st tripler stage (Q102) operates at a very low signal level. Therefore, a small amount of forward bias is supplied to increase the gain of this stage.

e. Audio Circuits

If the transmitter does not modulate properly, the audio circuits should be checked to make sure that the audio modulating voltage is reaching the modulator. The audio circuit is an integrated circuit version of the Motorola audio and I. D. C. circuit. External audio test signals can be coupled into the microphone terminals. In this manner, the audio circuitry can be signal traced.

The I. D. C. control is a printed circuit potentiometer. Care should be taken when setting this control for the proper deviation.

9. REPAIR TECHNIQUES

a. Printed Circuit Board

The transmitter and receiver are assembled on one printed circuit board. The board is made of glass-epoxy material with copper plated runners on both sides. Plating the copper onto the board extends copper in and through the component mounting holes thereby providing a better mechanical and electrical connection than obtained with an eyeletted etched board. Some holes will be found in the board that are not used and appear to be unnecessary. These holes are in addition to the component mounting holes and insure a reliable means of electrically connecting narrow runners from opposite sides of the board. A thin coating of glass epoxy laminate protects the runners on the component side of the board from accidental shorts with components during servicing and repair. Product reliability is increased through the use of this double-sided, plated-through circuit board.

In the past, servicemen have been led to believe that printed circuits are extremely fragile and that a low wattage soldering iron should be used to prevent damage to the board. This is a misconception. Experience has shown that using a low heat iron has, in many cases, caused the damage the serviceman was trying to prevent. The temperature of the connection must be raised until the solder flows freely around the board connection. This usually takes a considerable length of time with a low wattage soldering iron. During this period, heat is conducted away from the connection by the printed wiring causing them, in some instances, to break away from the board. Therefore, it is preferable that a medium heat iron in the 40-watt range be used which will heat the connection rapidly to the point where the solder flows freely. Obviously, an iron this hot should not be held on the connection longer than necessary. The soldering iron supplied with the Motorola TEK-4A Printed Circuit Repair Kit is recommended for all work on these boards.

b. Component Removal

Some components are arranged in "decks" or layers, with those least susceptible to failure on the lower level. At times, however, it may be necessary to remove other components in order to service the faulty one. Special care should be taken during troubleshooting to be as certain as possible that the suspected component is the faulty one.

Complete removal of the printed circuit boards is seldom necessary. Most components are accessible when the unit is mounted in the test jig. If board removal is necessary, observe standard servicing practices, such as tagging of leads and identification of connecting points.

c. Servicing Aids

Motorola has available several items which can be used to aid in parts replacement and repair of the printed circuit board.

The TEK-4A Printed Circuit Repair Kit supplies the basic tools needed for work on printed circuitry and miniature components. The following tools are included in the TEK-4A Printed Circuit Repair Kit.

ST-492	Tweezers
ST-494	Stainless Steel Pick
ST-496	Stainless Steel Pick
ST-725	Solder Extractor Bulb
ST-572	Resin Solvent
ST-493	Brush
ST-472	Soldering Iron
ST-481	Soldering Iron Tip (General usage)
66-84301A18	Soldering Iron Tip (Removal of integrated circuits)
66-83117C01	Clamping Pliers ("Seizers")

The components of the repair kit, with the possible exception of the solder extractor bulb, are standard items and need no special mention at this time. The solder extractor bulb is used to "take-up" the molten solder from a soldered connection on the printed circuit board when the soldering iron has brought the connection up to a high enough heat. With the excess of solder removed from the connection, the component can be removed from the board by further heating the connection while working the component loose. Once the component is removed, a pick can be used to open any filled holes on the circuit board by inserting it in the hole and heating the connection point with the iron gently rotating the pick back and forth to clear the hole. The clamping pliers (seizers) may be used in

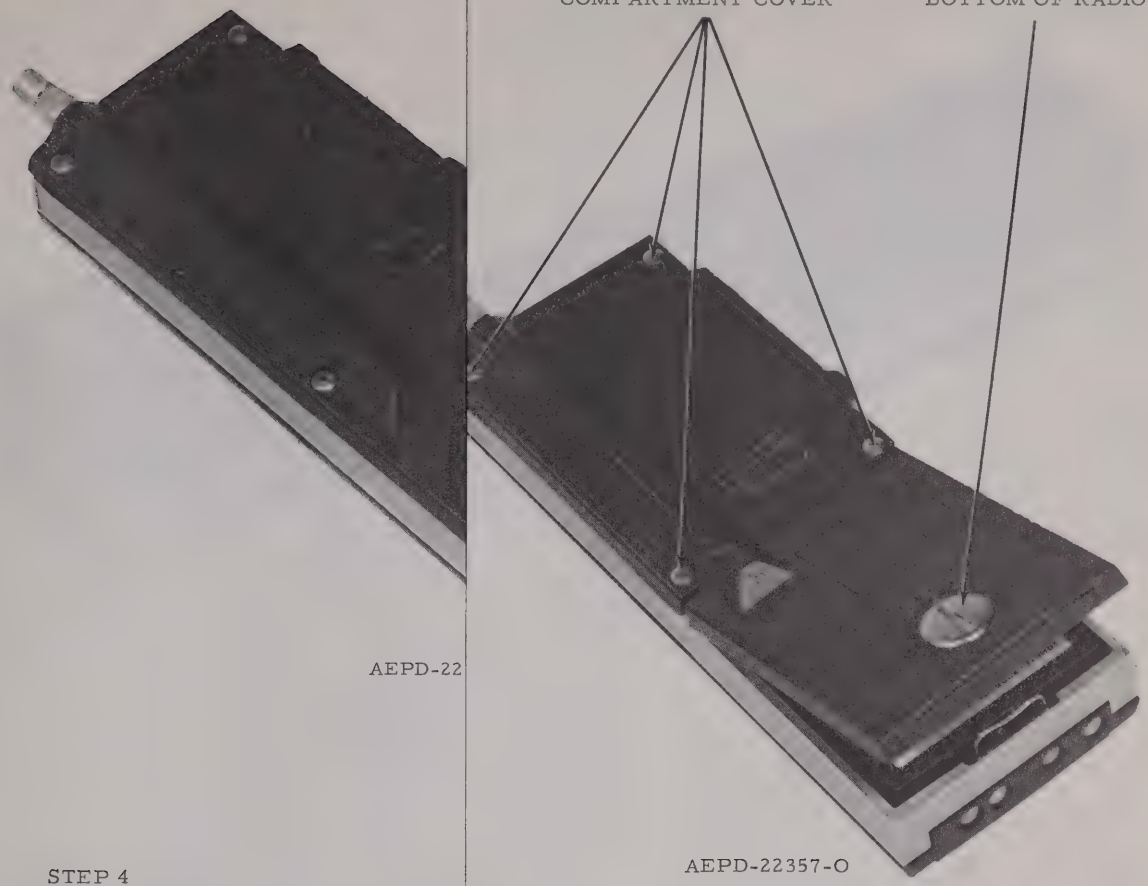
component replacement or removal, and also as a heat sink when replacing diodes or transistors, since excessive heat may damage these latter components. Use the resin solvent to remove excess flux after installing a new component.

d. Alignment Notes

When replacing crystals, realign the radio as described in the alignment procedure in this manual. Also, if any component in a tunable stage is replaced, realign the associated, the preceding, and the following stages.

STEP 3
LOOSEN THE FOUR
CAPTIVE SCREWS
AND REMOVE RADIO
COMPARTMENT COVER

STEP 2
REMOVE BATTERY
COVER BY LIFTING
UP AND TOWARDS
BOTTOM OF RADIO



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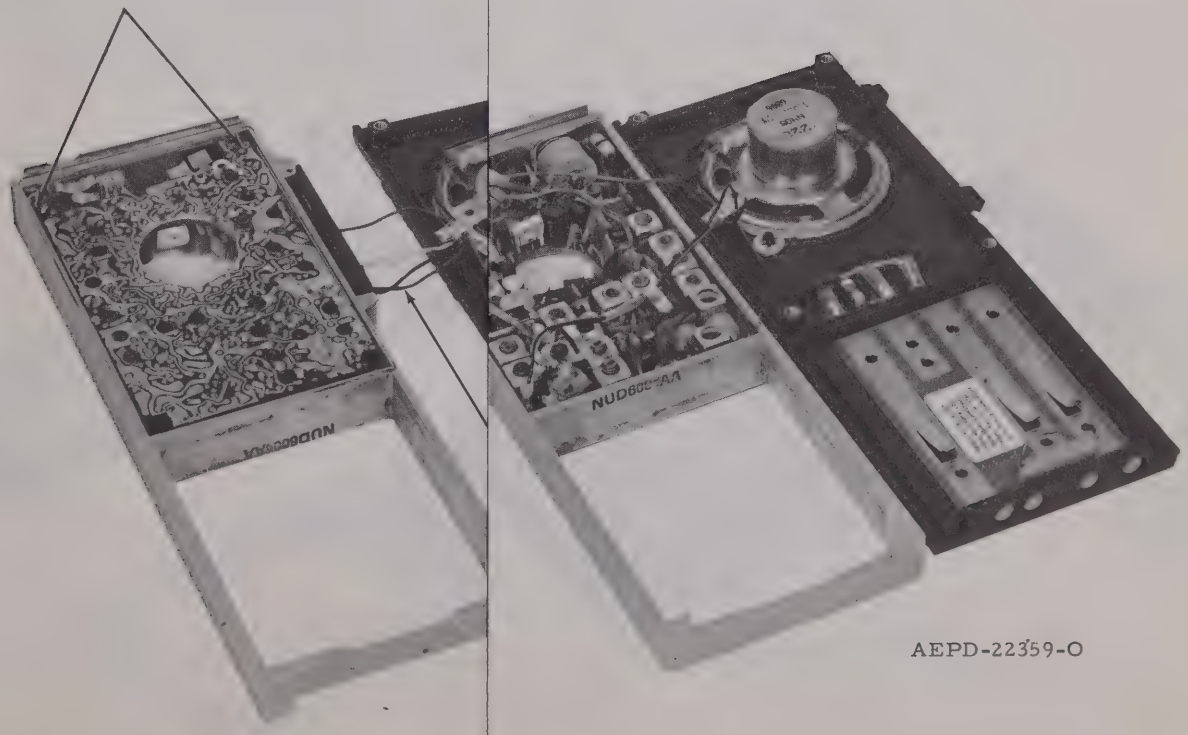
STEP 4
LOOSEN THE TWO CAPTIVE BUSHINGS
AND THEN LIFT RADIO AND MOVE FRONT
COVER ASSEMBLY TO SIDE.



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component replacement or removal, and also as a heat sink when replacing diodes or transistors, since excessive heat may damage these latter components. Use the resin solvent to remove excess flux after installing a new component.

d. Alignment Notes

When replacing crystals, realign the radio as described in the alignment procedure in this manual. Also, if any component in a tunable stage is replaced, realign the associated, the preceding, and the following stages.

TYPICAL SLIM-LINE DISASSEMBLY PROCEDURE

(MODEL SHOWN: SLIM-LINE, INTL SPKR/MIC, CARR SQUELCH, SINGLE FREQUENCY)

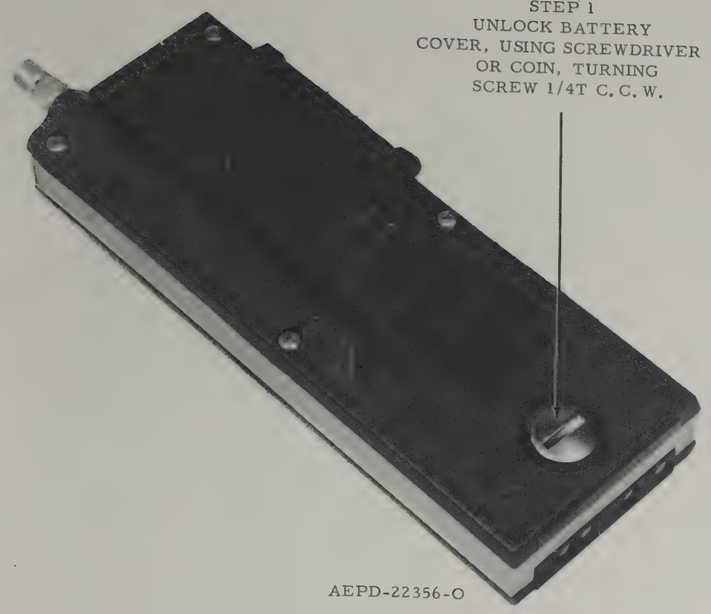
NOTES:

FOR ALL PARTS REPLACEMENTS EXCEPT VOLUME CONTROL, SQUELCH CONTROL, FREQUENCY SELECTOR SWITCH (IF USED), AND PUSH-TO-TALK SWITCH, THE RADIO SET REQUIRES NO FURTHER DISASSEMBLY. REFER TO ADVANCED DISASSEMBLY PROCEDURES IN ANOTHER SECTION OF THIS MANUAL FOR REPLACEMENT OR REPAIR OF ABOVE MENTIONED COMPONENTS.

ALL TRANSMITTER AND RECEIVER ALIGNMENT PROCEDURES MAY BE PERFORMED WITHOUT FURTHER DISASSEMBLY. ALL TRANSMITTER ALIGNMENT POINTS MAY BE TUNED WITH RADIO IN POSITION SHOWN IN STEP 4. RECEIVER 455 kHz FILTER ADJUSTMENTS (T5, L6) ARE MADE FROM THE COMPONENT SIDE OF RADIO SET CHASSIS.

EPD-22361-O

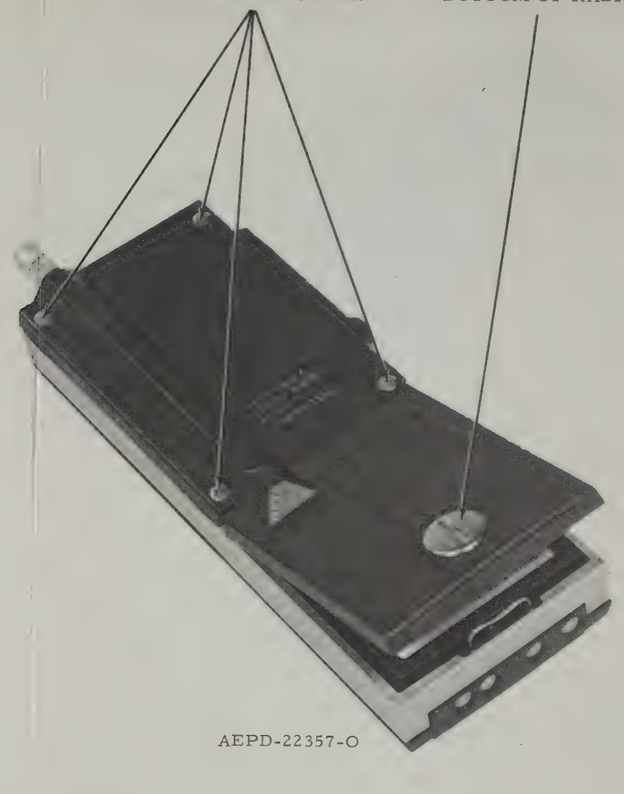
STEP 1
UNLOCK BATTERY COVER, USING SCREWDRIVER OR COIN, TURNING SCREW 1/4T C.C.W.



AEPD-22356-O

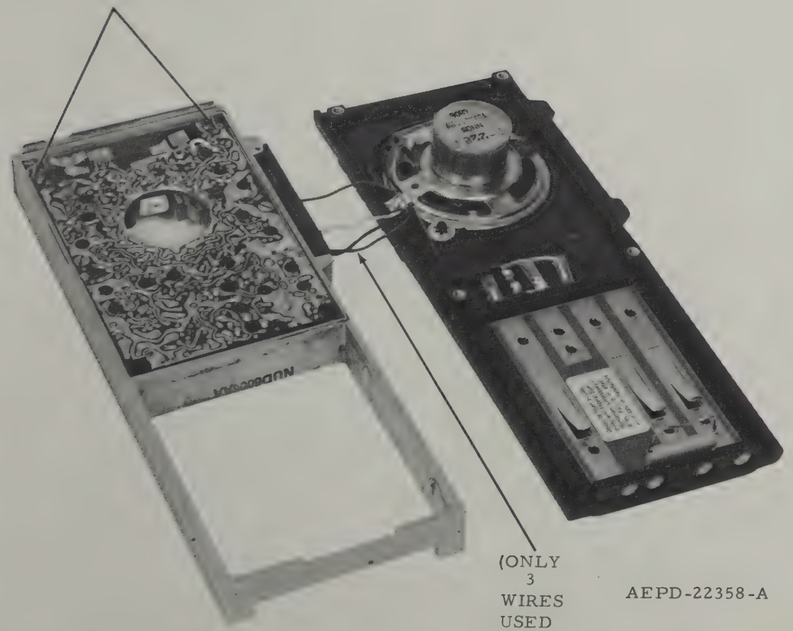
STEP 3
LOOSEN THE FOUR CAPTIVE SCREWS AND REMOVE RADIO COMPARTMENT COVER

STEP 2
REMOVE BATTERY COVER BY LIFTING UP AND TOWARDS BOTTOM OF RADIO



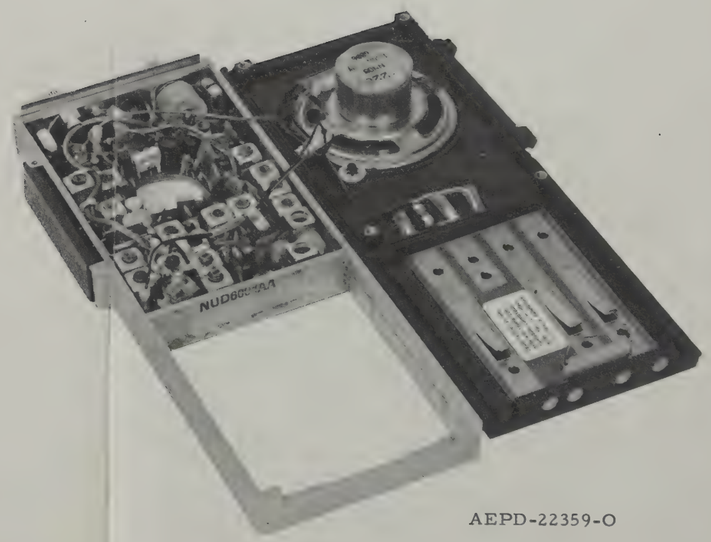
AEPD-22357-O

STEP 4
LOOSEN THE TWO CAPTIVE BUSHINGS AND THEN LIFT RADIO AND MOVE FRONT COVER ASSEMBLY TO SIDE.



(ONLY 3 WIRES USED IN COMBINATION SPKR-MIC MODELS)

AEPD-22358-A



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NI-HOUSING PROCEDURE

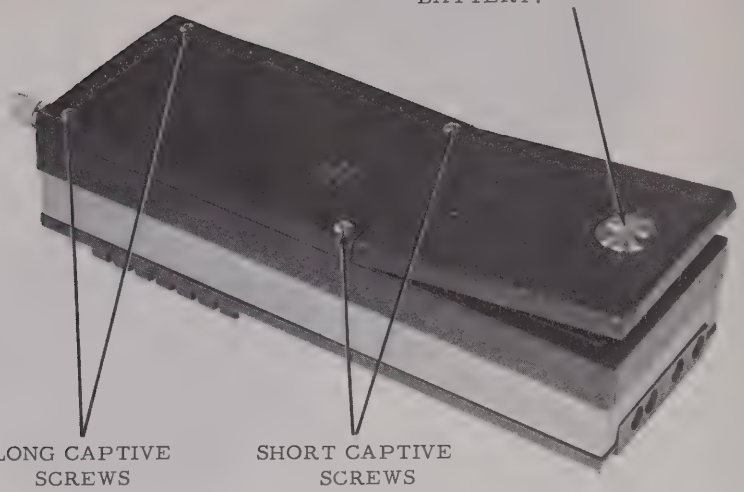
)USING, INTL SPKR/MIC, FREQUENCY)

LACEMENTS EXCEPT
QUELCH CONTROL,
OR SWITCH (IF USED),
SWITCH, THE RADIO
RTHER DISASSEMBLY.
) DISASSEMBLY PRO-
R SECTION OF THIS
CEMENT OR REPAIR
:D COMPONENTS.

ND RECEIVER ALIGN-
MAY BE PERFORMED
)ISASSEMBLY. ALL
MENT POINTS MAY
) IN POSITION SHOWN
R 455 kHz FILTER
6) ARE MADE FROM
E OF RADIO SET
'N IN STEP 6.)

EPD-23233-O

STEP 2
REMOVE BATTERY COVER BY LIFTING UP AND TOWARDS BOTTOM OF RADIO. REMOVE BATTERY.



AEPD-23329-O

STEP 3
LOOSEN TWO LONG AND TWO SHORT CAPTIVE SCREWS. REMOVE RADIO COMPARTMENT BACK COVER.

USHINGS.
ONT
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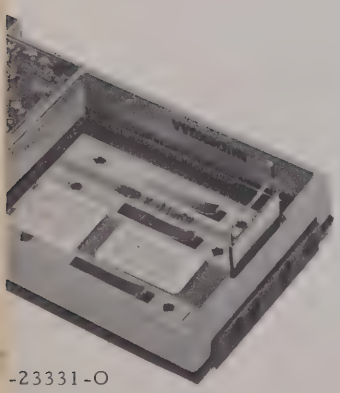
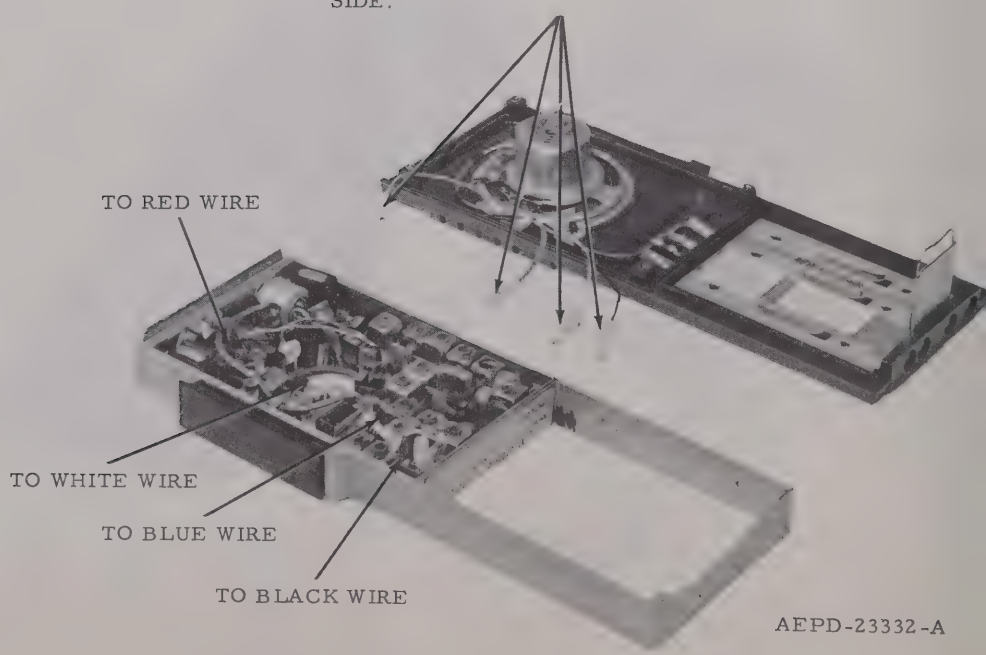
ING.

STEP 6
UNPLUG RED, BLUE, BLACK, AND WHITE WIRES (WHITE WIRE NOT USED IN MODELS WITH COMBINED SPKR-MIC) FROM PINS ON METAL FRAME. PLACE FRONT COVER AT SIDE.



-23331-O

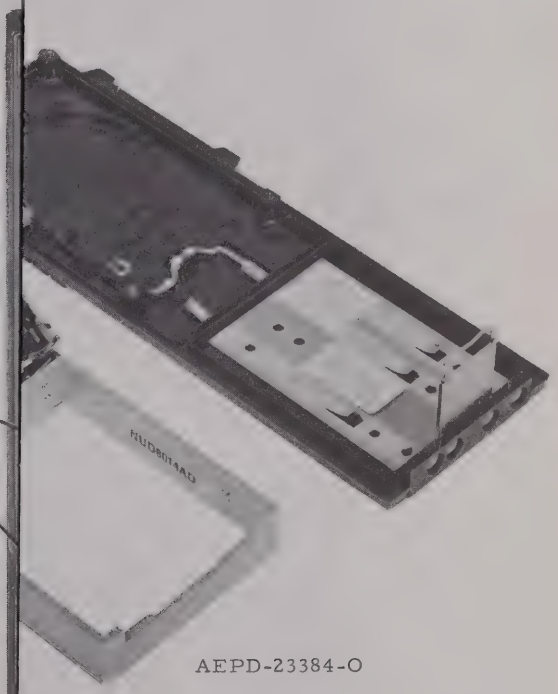


AEPD-23332-A

THE TYPICAL OMNI-HOUSING DI PICAL OMNI-HOUSING DISASSEMBLY
SHOWN) IS APPLICABLE EXCEPT FO (SPEAKER) OR WHITE (MICROPHONE)
OF THE INTERNAL SPEAKER AND

(1) BEFORE STARTING DISASSE
MICROPHONE UNIT BY LOOSENING T AS SHOWN BELOW FOR ACCESS TO
SPEAKER/MICROPHONE CONNECTOR ID/OR "VIBRASPONDER" RESONANT

(2) PROCEED WITH STEPS 1, 2, PLACE THE CIRCUIT BOARD BACK
PROCEDURE. REMOVING THE SLEE NOT TO DISLODGE THE SPONGE
ACCOMPLISHED AS FOLLOWS: PONDER" RESONANT REED ONCE



OARD
CAREFUL

OCKET.

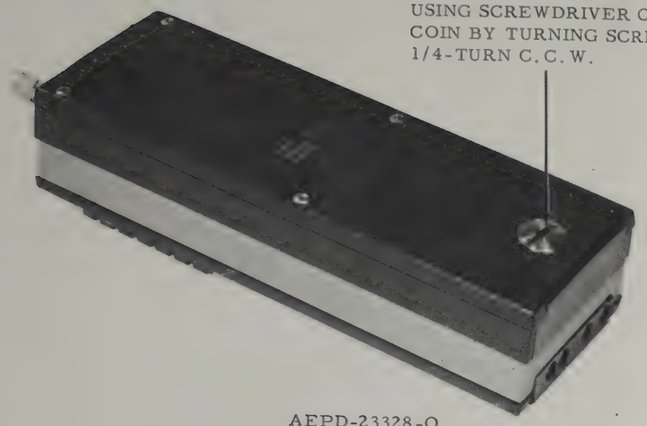
(4 FREQ MODE

(3) PROCEED WITH STEP 5 IN
TO SEPARATE THE CHASSIS FRAME

TYPICAL OMNI-HOUSING DISASSEMBLY PROCEDURE

(MODEL SHOWN: OMNI-HOUSING, INTL SPKR/MIC, CARR SQUELCH, SINGLE FREQUENCY)

STEP 1
UNLOCK BATTERY COVER USING SCREWDRIVER OR COIN BY TURNING SCREW 1/4-TURN C.C.W.



AEPD-23328-O

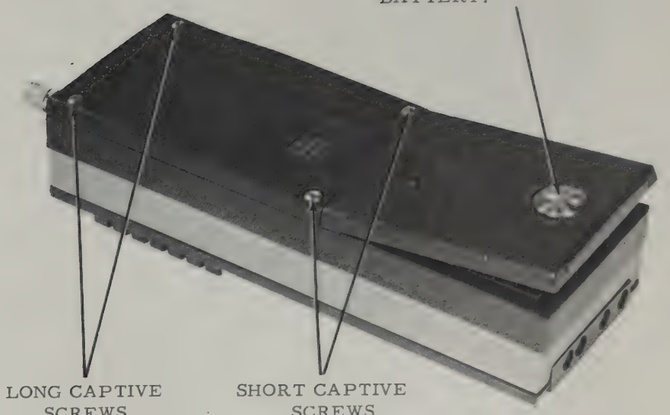
NOTES:

FOR ALL PARTS REPLACEMENTS EXCEPT VOLUME CONTROL, SQUELCH CONTROL, FREQUENCY SELECTOR SWITCH (IF USED), AND PUSH-TO-TALK SWITCH, THE RADIO SET REQUIRES NO FURTHER DISASSEMBLY. REFER TO ADVANCED DISASSEMBLY PROCEDURES IN ANOTHER SECTION OF THIS MANUAL FOR REPLACEMENT OR REPAIR OF ABOVE MENTIONED COMPONENTS.

ALL TRANSMITTER AND RECEIVER ALIGNMENT PROCEDURES MAY BE PERFORMED WITHOUT FURTHER DISASSEMBLY. ALL TRANSMITTER ALIGNMENT POINTS MAY BE TUNED WITH RADIO IN POSITION SHOWN IN STEP 5. RECEIVER 455 kHz FILTER ADJUSTMENTS (T5, L6) ARE MADE FROM THE COMPONENT SIDE OF RADIO SET CHASSIS. (SIDE SHOWN IN STEP 6.)

EPD-23233-O

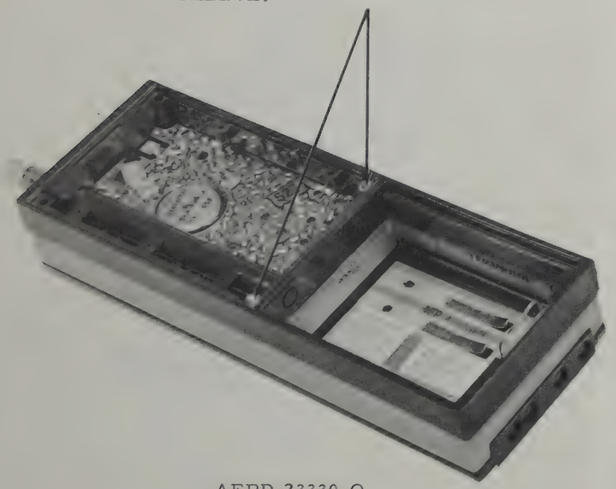
STEP 2
REMOVE BATTERY COVER BY LIFTING UP AND TOWARDS BOTTOM OF RADIO. REMOVE BATTERY.



AEPD-23329-O

STEP 3
LOOSEN TWO LONG AND TWO SHORT CAPTIVE SCREWS. REMOVE RADIO COMPARTMENT BACK COVER.

STEP 4
LOOSEN THE TWO CAPTIVE BUSHINGS AND REMOVE PLASTIC SLEEVE.

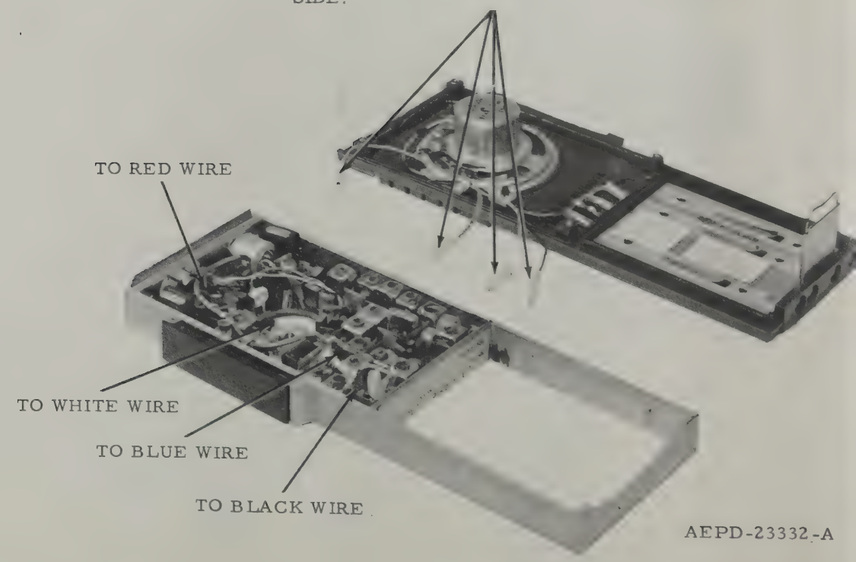


AEPD-23330-O

STEP 5
LOOSEN THE TWO CAPTIVE BUSHINGS. TURN METAL FRAME AND FRONT COVER OVER, BEING CAREFUL TO AVOID DAMAGING INTERCABLING.

AEPD-23331-O

STEP 6
UNPLUG RED, BLUE, BLACK, AND WHITE WIRES (WHITE WIRE NOT USED IN MODELS WITH COMBINED SPKR-MIC) FROM PINS ON METAL FRAME. PLACE FRONT COVER AT SIDE.



AEPD-23332-A

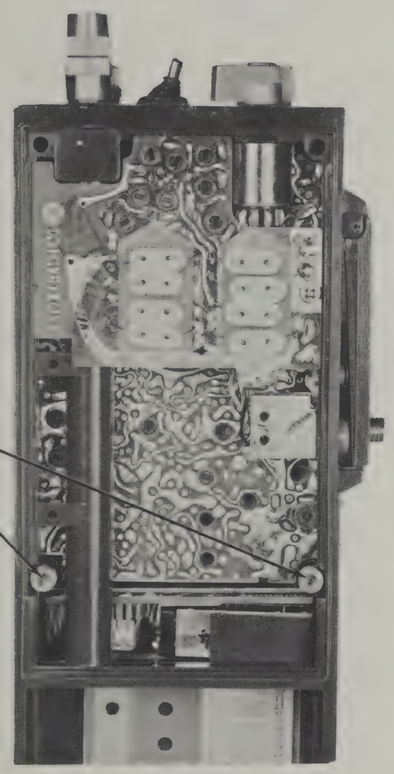
DISASSEMBLY PROCEDURE

(ADDITIONAL INFORMATION FOR OMNI-HOUSING MODEL WITH REMOTE SPKR/MIC AND PRIVATE-LINE SQUELCH)

THE TYPICAL OMNI-HOUSING DISASSEMBLY PROCEDURE (PREVIOUSLY HOWN) IS APPLICABLE EXCEPT FOR THE FOLLOWING CHANGES:

(1) BEFORE STARTING DISASSEMBLY, REMOVE THE REMOTE SPEAKER/ ICROPHONE UNIT BY LOOSENING THE PHILLIPS-HEAD SCREW ON THE PEAKER/MICROPHONE CONNECTOR COVER.

(2) PROCEED WITH STEPS 1, 2, AND 3 OF THE TYPICAL OMNI-HOUSING ROCEDURE. REMOVING THE SLEEVE FROM THE CHASSIS FRAME IS CCOMPLISHED AS FOLLOWS:



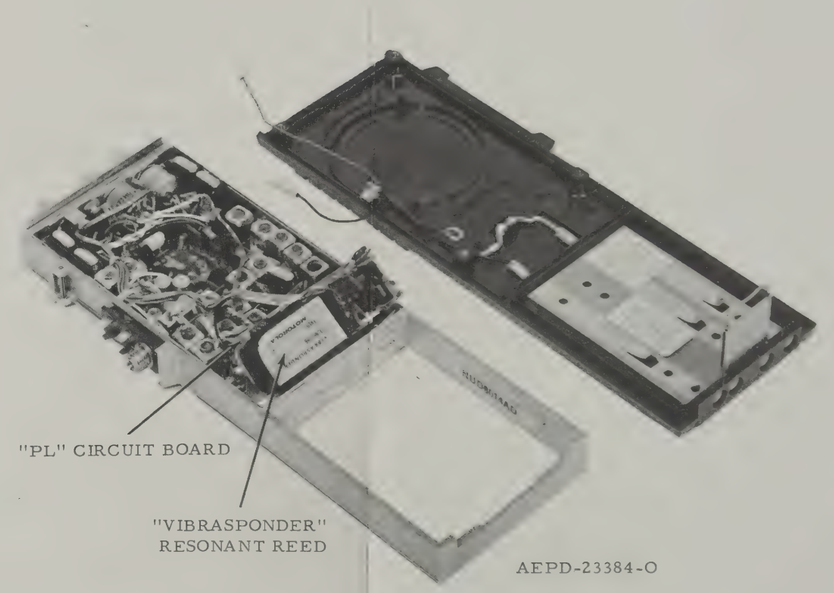
AEPD-23518-O

(4 FREQ MODEL SHOWN)

(3) PROCEED WITH STEP 5 IN THE TYPICAL OMNI-HOUSING PROCEDURE O SEPARATE THE CHASSIS FRAME FROM THE FRONT COVER.

(4) IN THE LAST STEP OF THE TYPICAL OMNI-HOUSING DISASSEMBLY PROCEDURE THERE WILL BE NO BLUE (SPEAKER) OR WHITE (MICROPHONE) WIRES TO UNPLUG DUE TO ABSENCE OF THE INTERNAL SPEAKER AND MICROPHONE.

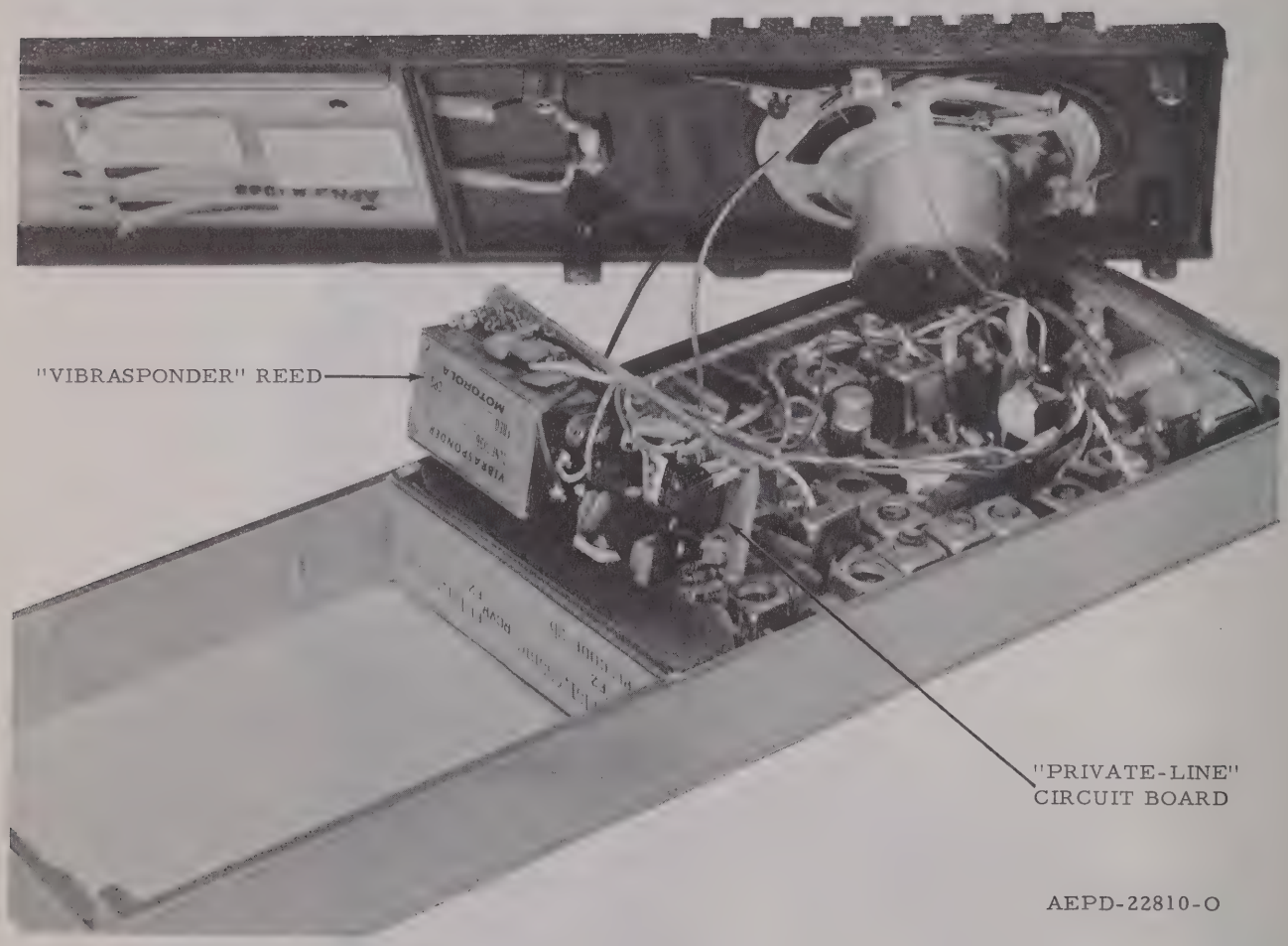
(5) CONTINUE WITH DISASSEMBLY AS SHOWN BELOW FOR ACCESS TO "PL" CIRCUIT BOARD COMPONENTS AND/OR "VIBRASPONDER" RESONANT REED. REVERSE THIS PROCEDURE TO PLACE THE CIRCUIT BOARD BACK IN THE CHASSIS FRAME, TAKING CARE NOT TO DISLODGE THE SPONGE TAPE USED TO CUSHION THE "VIBRASPONDER" RESONANT REED ONCE SEATED IN THE FRAME.



AEPD-23384-O

FROM OPPOSITE SIDE, PRESS "PL" CIRCUIT BOARD UP AND AWAY FROM METAL FRAME, BEING CAREFUL TO AVOID BREAKING INTERCABLING. PULL "VIBRASPONDER" RESONANT REED OUT OF SOCKET.

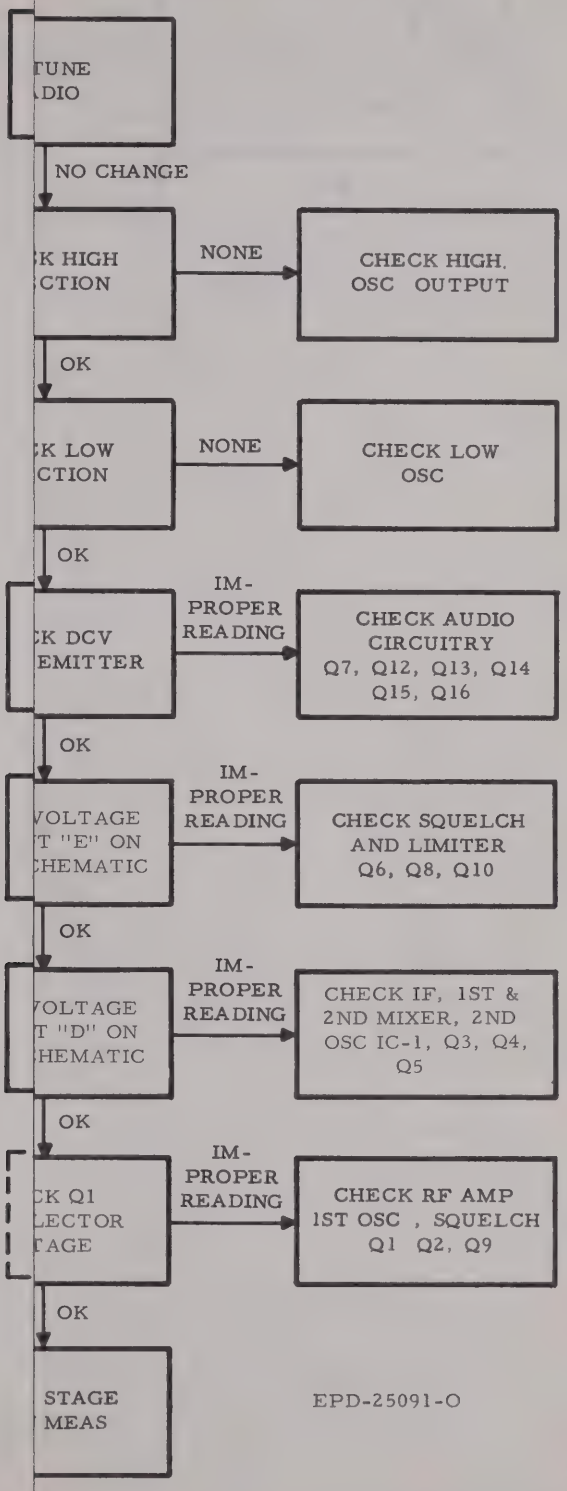
(4) TO GAIN ACCESS TO THE "VIBRASPONDER" REED AND "PL" CIRCUIT BOARD, CAREFULLY SLIP THE BOARD FROM THE CHASSIS FRAME AS SHOWN. THIS IS BEST DONE BY GRASPING THE CHASSIS FRAME AND PRESSING THE BOARD UP FROM THE OPPOSITE SIDE WITH THE FINGERS. BE CAREFUL NOT TO BREAK THE WIRES INTERCONNECTING THE "PL" BOARD WITH THE TRANSMITTER-RECEIVER BOARD AND THE WIRES INTERCONNECTING THE SPEAKER/MICROPHONE WITH THE TRANSMITTER-RECEIVER BOARD.



(5) REVERSE THE PROCEDURE TO PLACE THE CIRCUIT BOARD BACK IN THE CHASSIS FRAME, TAKING CARE NOT TO DISLODGE THE SPONGE TAPE USED TO CUSHION THE "VIBRASPONDER" REED ONCE PROPERLY SEATED IN THE FRAME.

NOTE

E NKD6001B TUNE-UP CABLE MUST BE USED
EN ALIGNING RECEIVER WITH SIGNAL GEN-
ATOR IN ORDER TO SIMULATE THE ACTUAL
PEDANCE OF THE ANTENNA.



EPD-25091-O

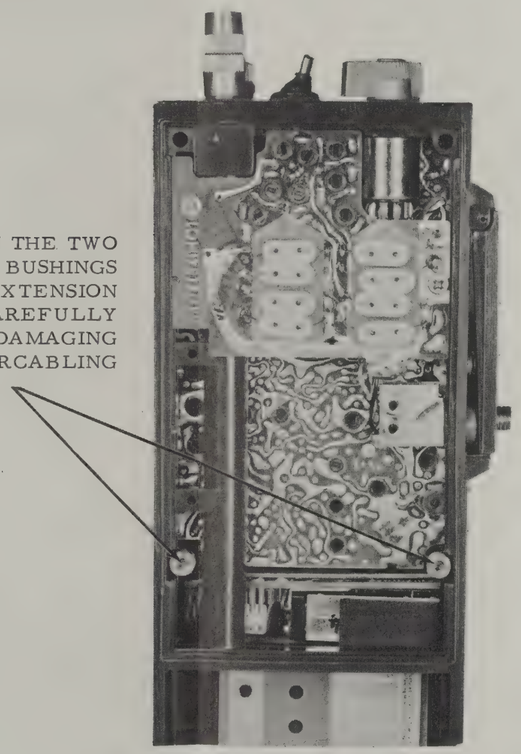
Receiver Troubleshooting Chart
Motorola No. EPD-25091-O
12/8/70-CP

DISASSEMBLY PROCEDURE

(ADDITIONAL INFORMATION FOR OMNI-HOUSING MODEL WITH UNIVERSAL SPKR/MIC, AND PRIVATE-LINE SQUELCH)

(1) THE TYPICAL OMNI-HOUSING DISASSEMBLY PROCEDURE (PREVIOUSLY SHOWN) IS FULLY APPLICABLE, EXCEPT THAT THE EXTERNAL SPEAKER/ MICROPHONE UNIT SHOULD BE REMOVED BEFORE STARTING DISASSEMBLY BY LOOSENING THE THUMB SCREW ON THE SPEAKER/MICROPHONE CONNECTOR COVER.

(2) PROCEED WITH STEPS 1, 2, AND 3 OF THE TYPICAL OMNI-HOUSING PROCEDURE. REMOVING THE SLEEVE FROM THE CHASSIS FRAME IS ACCOMPLISHED AS FOLLOWS:

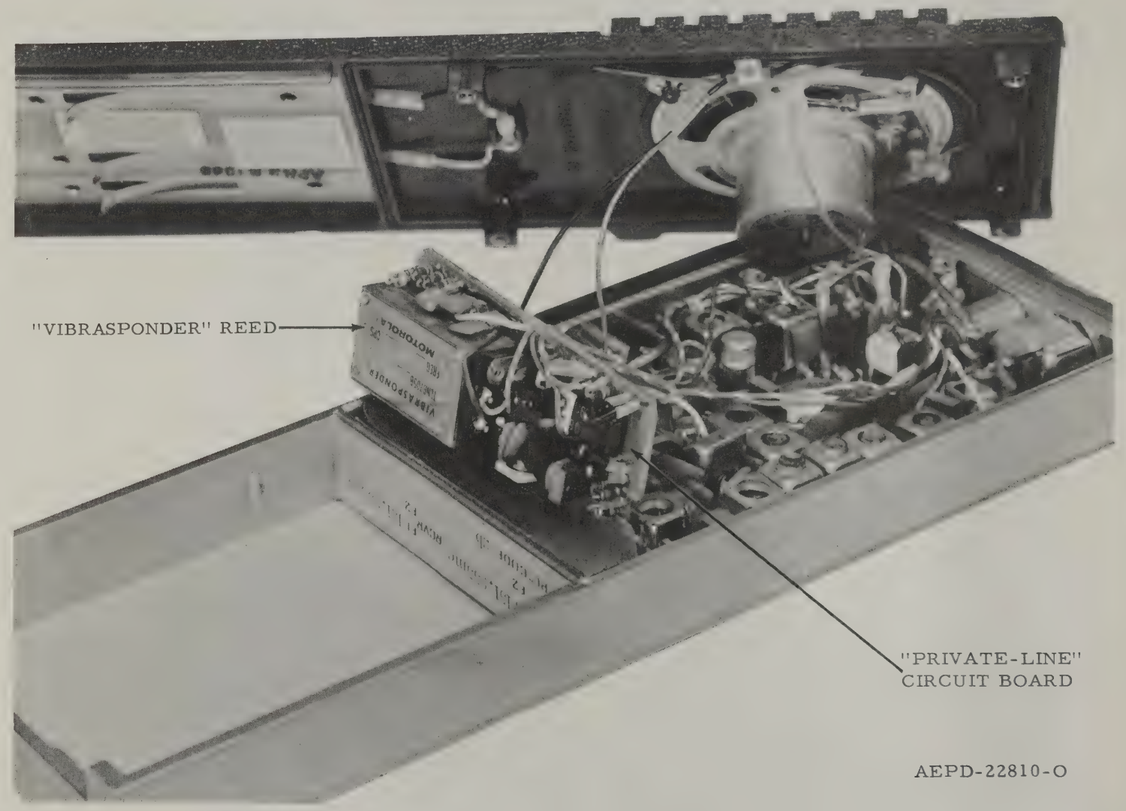


AEPD-23518-O

(4 FREQ MODEL SHOWN)

(3) PROCEED WITH STEP 5 IN THE TYPICAL OMNI-HOUSING PROCEDURE TO SEPARATE THE CHASSIS FRAME FROM THE FRONT COVER.

(4) TO GAIN ACCESS TO THE "VIBRASPONDER" REED AND "PL" CIRCUIT BOARD, CAREFULLY SLIP THE BOARD FROM THE CHASSIS FRAME AS SHOWN. THIS IS BEST DONE BY GRASPING THE CHASSIS FRAME AND PRESSING THE BOARD UP FROM THE OPPOSITE SIDE WITH THE FINGERS. BE CAREFUL NOT TO BREAK THE WIRES INTERCONNECTING THE "PL" BOARD WITH THE TRANS - MITTER-RECEIVER BOARD AND THE WIRES INTERCONNECTING THE SPEAKER/ MICROPHONE WITH THE TRANSMITTER-RECEIVER BOARD.

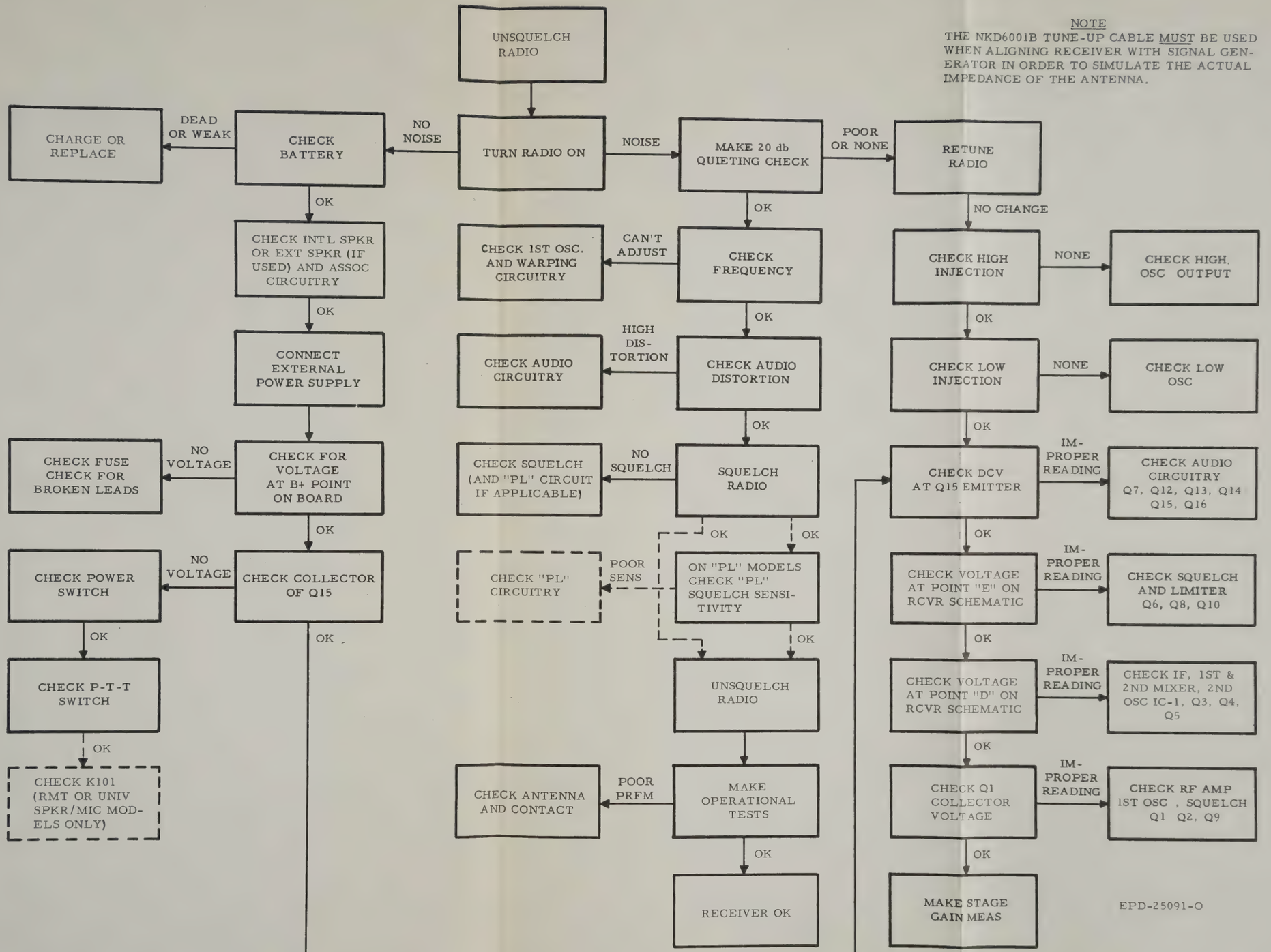


AEPD-22810-O

(5) REVERSE THE PROCEDURE TO PLACE THE CIRCUIT BOARD BACK IN THE CHASSIS FRAME, TAKING CARE NOT TO DISLODGE THE SPONGE TAPE USED TO CUSHION THE "VIBRASPONDER" REED ONCE PROPERLY SEATED IN THE FRAME.

NOTE

THE NKD6001B TUNE-UP CABLE MUST BE USED WHEN ALIGNING RECEIVER WITH SIGNAL GENERATOR IN ORDER TO SIMULATE THE ACTUAL IMPEDANCE OF THE ANTENNA.

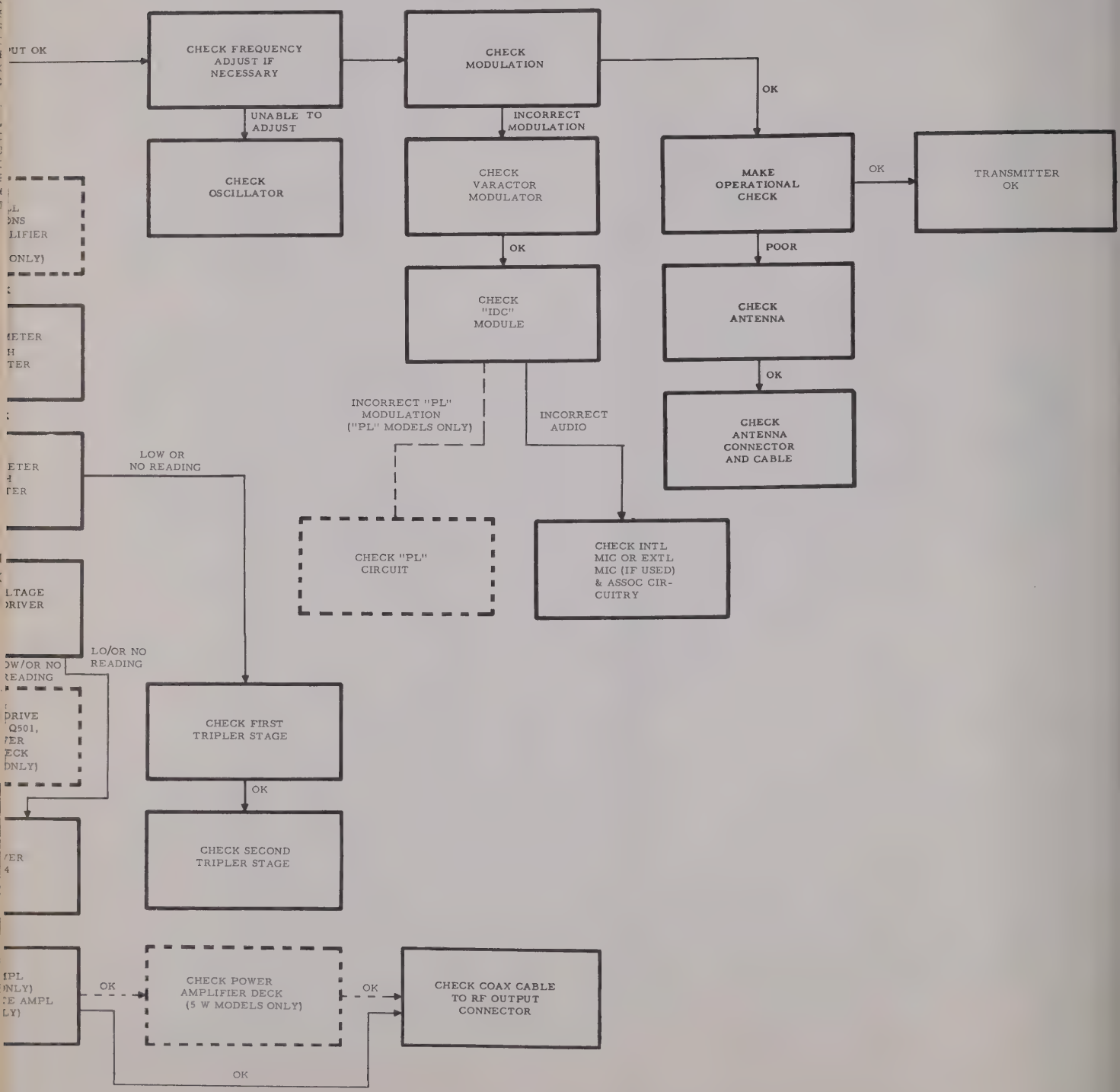


EPD-25091-O

Receiver Troubleshooting Chart
Motorola No. EPD-25091-O
12/8/70-CP

NOTE

THE NKD6001B TUNE-UP CABLE MUST BE USED WHEN ALIGNING TRANSMITTER INTO A 50 OHM WATTMETER IN ORDER TO SIMULATE THE ACTUAL IMPEDANCE OF THE ANTENNA. REDUCED RADIATED POWER WILL RESULT IF THE RADIO IS TUNED DIRECTLY INTO THE WATTMETER WITHOUT THE TUNE-UP CABLE.



RECEIVER ALIGNMENT

1. Test Equip required for receiver alignment:
   a. DC m DC Multimeter, or equivalent.
   b. AC vo AC Voltmeter, or equivalent.
   c. Labor 1034C Signal Generator, or equivalent.
   d. Motor 1056A-9A or TU546 Series Test Set with 455 kHz crystal or equivalent crystal oscillator.
   e. Motor Tune-up Cable NKD6001B.
2. Notes Tuning Tool NLN6689A.
   a. Conne Model
   b. All m
   c. When eleme
   d. For n from
   e. Steps
   f. Steps
   g. In ste Oscillator Frequency the co
   h. After ier Frequency recei
   i. All re F Frequency = (16.8 MHz)
   j. A ma Oscillator Frequency (see table below)

FREQUENCY CALCULATIONS

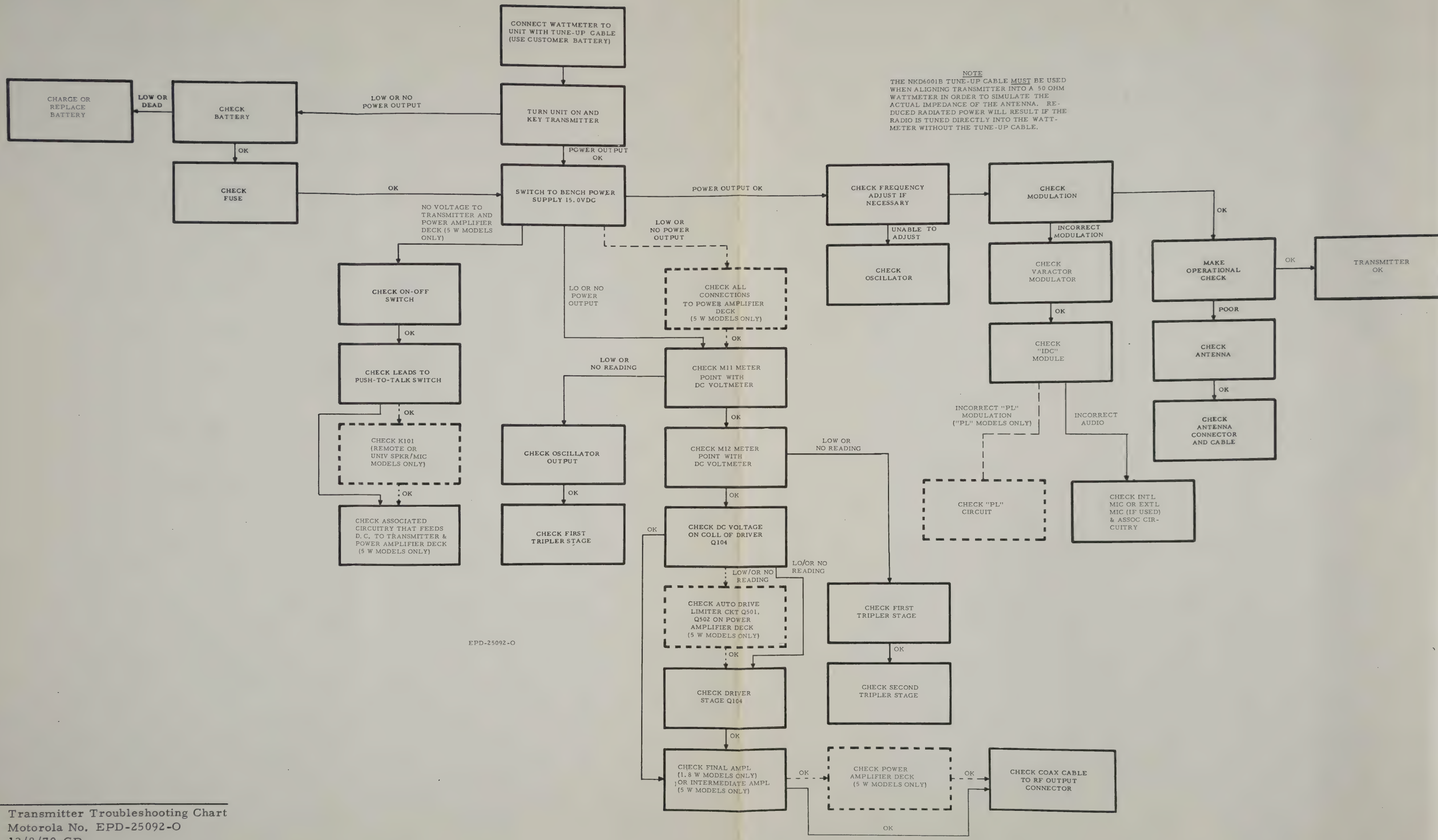
STEP	UV	r Frequency) (MHz)	F_{02} (2nd Oscillator Frequency) (MHz)
		000-138.500	16.345
		501-142.000	17.255
1	No	001-147.000	16.345
2	No	001-150.800	17.255
3	No	801-162.000	16.345
4	No	001-170.000	17.255
5	10	001-174.000	16.345
6	10		
7	1	F Frequency = 455 kHz	
8	1		
9			
10			
11	No		

NOTES

hould be tuned to the peak nearest the printed circuit board unless stated otherwise.
dio set on and set the squelch control for maximum noise.
perating on two or more frequencies, set Frequency Selector Switch to lowest frequency.
metallic tuning tool (supplied) for tuning T6 and L7.

1. Test Equi
   a. Moto
   b. Moto
   c. Moto

T CONTINUED ON REVERSE SIDE


CONNECT WATTMETER TO UNIT WITH TUNE-UP CABLE (USE CUSTOMER BATTERY)
TURN UNIT ON AND KEY TRANSMITTER
LOW OR NO POWER OUTPUT
CHECK BATTERY
LOW OR DEAD
CHARGE OR REPLACE BATTERY
OK
CHECK FUSE
POWER OUTPUT OK
SWITCH TO BENCH POWER SUPPLY 15.0VDC
OK
NO VOLTAGE TO TRANSMITTER AND POWER AMPLIFIER DECK (5 W MODELS ONLY)
LOW OR NO POWER OUTPUT
CHECK ON-OFF SWITCH
OK
CHECK LEADS TO PUSH-TO-TALK SWITCH
OK
CHECK K101 (REMOTE OR UNIV SPKR/MIC MODELS ONLY)
OK
CHECK ASSOCIATED CIRCUITRY THAT FEEDS D.C. TO TRANSMITTER & POWER AMPLIFIER DECK (5 W MODELS ONLY)
LO OR NO POWER OUTPUT
CHECK ALL CONNECTIONS TO POWER AMPLIFIER DECK (5 W MODELS ONLY)
OK
LOW OR NO READING
CHECK M11 METER POINT WITH DC VOLTMETER
OK
CHECK OSCILLATOR OUTPUT
OK
CHECK FIRST TRIPLER STAGE
CHECK M12 METER POINT WITH DC VOLTMETER
LOW OR NO READING
OK
CHECK DC VOLTAGE ON COLL OF DRIVER Q104
OK
LOW/OR NO READING
LO/OR NO READING
CHECK AUTO DRIVE LIMITER CKT Q501, Q502 ON POWER AMPLIFIER DECK (5 W MODELS ONLY)
OK
CHECK DRIVER STAGE Q104
OK
CHECK FINAL AMPL (1.8 W MODELS ONLY) OR INTERMEDIATE AMPL (5 W MODELS ONLY)
OK
CHECK POWER AMPLIFIER DECK (5 W MODELS ONLY)
OK
CHECK COAX CABLE TO RF OUTPUT CONNECTOR
OK
CHECK FIRST TRIPLER STAGE
OK
CHECK SECOND TRIPLER STAGE
NOTE
THE NKD6001B TUNE-UP CABLE MUST BE USED WHEN ALIGNING TRANSMITTER INTO A 50 OHM WATTMETER IN ORDER TO SIMULATE THE ACTUAL IMPEDANCE OF THE ANTENNA. REDUCED RADIATED POWER WILL RESULT IF THE RADIO IS TUNED DIRECTLY INTO THE WATTMETER WITHOUT THE TUNE-UP CABLE.
POWER OUTPUT OK
CHECK FREQUENCY ADJUST IF NECESSARY
UNABLE TO ADJUST
CHECK OSCILLATOR
CHECK MODULATION
INCORRECT MODULATION
CHECK VARACTOR MODULATOR
OK
CHECK "IDC" MODULE
INCORRECT "PL" MODULATION ("PL" MODELS ONLY)
CHECK "PL" CIRCUIT
INCORRECT AUDIO
CHECK INTL MIC OR EXTL MIC (IF USED) & ASSOC CIRCUITRY
OK
MAKE OPERATIONAL CHECK
OK
TRANSMITTER OK
POOR
CHECK ANTENNA
OK
CHECK ANTENNA CONNECTOR AND CABLE

EPD-25092-O

RECEIVER RF AND IF STAGE GAIN MEASUREMENT CHART

1. Test Equipment Required
   a. DC multimeter with rf probe.
   b. AC voltmeter.
   c. Laboratory type rf voltmeter.
   d. Motorola Model T1034C Signal Generator, or equivalent.
   e. Motorola Model NKD6001B Tune-up Cable.

2. Notes
   a. Connect the Motorola Model T1034C Signal Generator to the radio set using the Motorola Model NKD6001B Tune-up Cable.
   b. All measurements are taken using 15.0 v dc input.
   c. When measuring rf voltages; connect the ground clip to the nearest ground point at the element being measured.
   d. For noise readings, the signal generator frequency must be set to a frequency removed from the carrier frequency.
   e. Steps 1 and 3 provide a measure of oscillator activity.
   f. Steps 2 and 4 provide a measurement of high and low oscillator injection.
   g. In steps 5 through 10, repeak the coils as necessary for a peak reading. The tuning of the coils may be different for each type of meter.
   h. After completing the stage gain measurements, retune the receiver according to the receiver alignment procedure.
   i. All readings indicated in the chart are for a normally operating receiver.
   j. A malfunctioning receiver will cause the chart readings to differ.

STEP	UV INPUT	METER POINT	READINGS IN VOLTS		
			LAB. RF VOLTMETER	AC VOLTMETER	DC VTVM (With RF Probe)
1	Noise	Emitter Q2	.70	- - - - -	.67
2	Noise	Base Q3	.12	- - - - -	.06
3	Noise	Emitter Q4	.90	- - - - -	.80
4	Noise	Base Q5	.08	- - - - -	.04
5	10,000	Collector Q1	.20	- - - - -	.08
6	10,000	Base Q3	.30	- - - - -	.10
7	1,000	Collector Q3	.70	- - - - -	.65
8	1,000	Base Q5	.11	- - - - -	.06
9	100	Collector Q5	.70	- - - - -	.60
10	100	Pin 10 IC-1	.03	-28 dbm	.015
11	Noise	M2	- - -	-40 dbm	- - -

AUDIO AMPLIFIER MEASUREMENT CHART

1. Test Equipment Required
   a. Motorola Model T1034C Signal Generator, or equivalent.
   b. Motorola Model NKD6001B Tune-up Cable.
   c. Motorola AC Voltmeter, or equivalent.

2. Notes
   a. Connect the Motorola Model T1034C Signal Generator to the radio set using the NKD6001B Tune-up Cable.
   b. Modulate the signal generator with a 1000 Hz tone adjusted to 3.3 kHz deviation. Tune the signal generator to the carrier frequency (zero reading at test point M4) and set the rf input signal to 100 microvolts.
   c. The readings shown in the chart are taken with an AC voltmeter.
   d. All measurements are taken using a 15.0 volt dc input.
   e. Adjust the volume control for rated audio output.

STEP	INPUT	METER POINT	READINGS
1	100 uv	M4	-13 dbm
2	100 uv	Emitter Q7	-12 dbm
3	100 uv	Base Q12	-40 dbm
4	100 uv	Emitter Q15	+16 dbm
5	100 uv	Speaker (M5 for rmt spkr/mic models*)	+15 dbm

*See printed circuit board details for location of M5.

SQUELCH MEASUREMENTS CHART

1. Test Equipment Required
   a. Motorola AC Voltmeter, or equivalent.
   b. Motorola DC Multimeter, or equivalent.
   c. Motorola Model T1034C Signal Generator and Model NKD6001B Tune-up Cable.

2. Notes
   a. Set the squelch control fully clockwise.
   b. Connect the Motorola Model T1034C Signal Generator to the radio set using the Model NKD6001B Tune-up Cable.
   c. All measurements are taken with 15.0 v dc input.
   d. For noise readings the signal generator frequency must be set to a frequency removed from the carrier frequency.

STEP	INPUT	METER POINT	READINGS	
			AC VOLTMETER	DC MULTIMETER
1	Noise	Collector Q8	+8.5 dbm	- - - - -
2	Noise	Collector Q9	- - - - -	.9 v
3	Noise	Collector Q10	- - - - -	1.6 v
4	Noise	Base Q11	- - - - -	.6 v

NOTE

The NKD6001B Tune-up Cable must be used when aligning receiver with signal generator in order to simulate the actual impedance of the antenna.

Receiver Metering
And Alignment Points

RECEIVER ALIGNMENT

Test equipment required for receiver alignment:

1. Motorola DC Multimeter, or equivalent.
2. Motorola AC Voltmeter, or equivalent.
3. Motorola T1034C Signal Generator, or equivalent.
4. Motorola S1056A-9A or TU546 Series Test Set with 455 kHz crystal or equivalent crystal controlled oscillator.
5. Motorola Tune-up Cable NKD6001B.
6. Motorola Tuning Tool NLN6689A.

FREQUENCY CALCULATIONS

$$F_{01} = F_c - \frac{F_1}{3}$$

F_{01} = 1st Oscillator Frequency

F_c = Carrier Frequency

F_1 = 1st IF Frequency = (16.8 MHz)

F_{02} = 2nd Oscillator Frequency (see table below)

F_c (Carrier Frequency) (MHz)	F_{02} (2nd Oscillator Frequency) (MHz)
136.000-138.500	16.345
138.501-142.000	17.255
142.001-147.000	16.345
147.001-150.800	17.255
150.801-162.000	16.345
162.001-170.000	17.255
170.001-174.000	16.345

F_2 = 2nd IF Frequency = 455 kHz

NOTES

1. All slugs should be tuned to the peak nearest the printed circuit board unless stated otherwise.
2. Turn the radio set on and set the squelch control for maximum noise.
3. On radios operating on two or more frequencies, set Frequency Selector Switch to lowest frequency.
4. Use a non-metallic tuning tool (supplied) for tuning T6 and L7.

ALIGNMENT CONTINUED ON REVERSE SIDE

Receiver Alignment Procedure
Motorola No. EPD-25028-B
11/15/71-CP

NOTE

06001B Tune-up Cable must be used when aligning transmitter into a wattmeter in order to simulate the actual impedance of the antenna. radiated power will result if the radio is tuned directly into the watt- ithout the tune-up cable.

FCC regulatio

1. Radio tra cial radio
2. The rf po technical
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ENT	METER POINT	ADJUSTMENT	PROCEDURE
	----	----	OSCILLATOR: L101* is preset to the assigned frequency at the factory. Do not readjust L101 unless the crystal is replaced or the setting was accidentally changed. If it is necessary to readjust L101, use the frequency meter to adjust L101 for zero reading. TRANSMITTERS WITH TWO OR MORE FREQUENCIES ONLY OSCILLATOR NO. 2, 3, 4, 5, and 6 (as applicable): Use the same procedure as above, substituting L201, etc.* for L101.
	----	----	Adjust power supply voltage for 15.0 V.
neter	M11	L101* L201* Etc.*	NOTE: See step 1 above before performing this step. Tune L101 for a dip. If applicable, switch to F2 through F6 and tune L201, etc.* for a dip.
neter	M12	L103 L104	Tune L103 and L104 for a maximum reading. Retune these coils at least once to insure that a maximum has been obtained. This circuit is tuned to three times the crystal frequency.
neter	M12	L105	Tune L105 for a dip in the meter reading. This circuit is tuned to nine times the crystal frequency.
eter 001B Cable	----	L106 L107 L109 L111 L112	Tune L106 for maximum power output; then tune for maximum power output in pairs as follows: Tune L107 for maximum power output, then L109, then repeak L107. Repeat for L111 and L112.
eter 001B Cable	----	L105 L106	Repeak L105 and L106 for maximum power output.
eter, 3 Cable	----	L107 L109 L111 L112	Repeak L107 and L109 for maximum power output, then repeat, using L111 and L112.
eter, and 3 Cable	----	L112	Tune L112 until the current drain decreases to a current dip point. When this point is reached, adjust L112 until the total current drain is slightly above the minimum obtained in the dip and the power output is above that which occurs at the current dip. NOTE: If a current dip cannot be obtained, tune L112 until the current decreases and the power output is about 2.25 watts.
eter	----	L111	Tune L111 into the board until the power output is about 2.0 watts.

STEP	TEST EQUIPMENT	METER POINT	ADJUSTMENT	PROCEDURE
1	DC Multimeter	M3	T6	Connect the 455 kHz output of the test set to the unused tap of L6. With the DC Multimeter monitor M3 and tune T6 to the first peak. Typical reading is +2.2 v dc
2	DC Multimeter	M4	L7	With the set up in step 1, monitor the discriminator output M4. Tune L7 for zero volts. Tune to the first zero reading. This setting should be within ±.01 v dc of zero volts. Disconnect the 455 kHz signal from the radio.
3	DC Multimeter T1034C Signal Generator	M4	Signal Generator	Set RF signal generator to 50,000 uv and adjust to the lowest carrier frequency being used. Monitor M4 for zero volts.
*4	AC Voltmeter T1034C Signal Generator and NKD6001B Tune-up Cable	M2	L1, T1, T2, T3, T7, T4, T5, L6	Tune L1, T1, T2, T3, T7, T4, T5, L6 for a maximum reading at M2. Keep the M2 reading below -30 dbm by reducing the signal generator input. Retune the coils to make sure they are peaked. On radios with two or more frequencies, with separation of 0.3 to 2.0 MHz, remove signal and balance tune L1, T1, T2, and T3 on noise at M4 for equal noise readings on all frequencies. Note: T7, T4, T5, and L6 must be tuned carefully with the signal generator set to discriminator zero ±.01 v dc
5	DC Multimeter	M4	L2 (See note)	Use the base station transmitter or a frequency standard as a signal source and adjust L2 for a zero DC voltage at M4.
6	DC Multimeter	M4	L301, etc. (See note)	Repeat step 5 for the 2nd thru 6th frequencies of the radio, as applicable.
7	AC Voltmeter T1034C Signal Generator and NKD6001B Tune-up Cable	Speaker (M5 for remote spkr/mic models)	Signal Generator	Adjust the volume control for an output voltage across the speaker of 0 dbm (noise only - no signal output). Increase the input signal until the noise is reduced to one tenth of the reading with no signal. Read the attenuator scale in microvolts. This is the 20 db quieting sensitivity and should be less than 0.35 uv. Repeat for all frequencies as applicable.

***CAUTION**: After completing this step, look for the image frequency at 910 kHz below this setting as a check on the accuracy of the signal generator setting. Upon locating the image, return to the proper setting for the carrier frequency.

NOTE

L2 reference designation applies to 1st oscillator coil of 1- and 2-frequency, internal speaker/microphone, or remote speaker/microphone models only. L301 reference designation applies to 2-frequency, internal speaker/microphone, or remote speaker/microphone models only. For reference designations of 1st oscillator coils applicable to other models, see associated internal, remote, or universal schematic diagram.

TRANSMITTER PRE-ALIGNMENT NOTES

EXCERPTS FROM FCC REGULATIONS

FCC regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class commercial radiotelephone operator's license or by personnel working under their immediate supervision.
2. The rf power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and the local conditions.
3. Frequency and deviation of a transmitter must be checked before it is placed in service and re-checked once each year thereafter.

TEST EQUIPMENT REQUIRED

1. Motorola NLN6689A Alignment Tool (supplied), or equivalent.
2. Motorola S1052B or S1063A Solid-State DC Multimeter, or equivalent.
3. Motorola S1051C or S1053C Solid-State AC Voltmeter, or equivalent.
4. Bird Model 61 RF Wattmeter (50-ohm impedance), or equivalent.
5. Motorola TEK-23 Power Supply, or equivalent.
6. Motorola S1325A Digital Frequency Meter/Deviation Meter, Motorola S1059A Portable Test Set (including deviation meter and peaking generator), or equivalent.
7. Motorola TEK-1A Transistorized Tone Oscillator, or equivalent.
8. Motorola NKD6001B Tune-Up Cable.
9. Ammeter (0-500 mA dc).
10. Motorola S1324A Digital Frequency Meter (not required if S1325A is used).

NOMINAL VOLTAGE READINGS

NOTE

The following readings apply to a fully tuned transmitter with 14.5 V dc input.

METER POINT	M11	M12
READING (VDC)	+8.0	+2.3

PRELIMINARY SET-UP FOR TRANSMITTER ALIGNMENT

1. Place the unit face down and remove the back cover.
2. For complete alignment, the battery should be removed and a 15.0 volt dc power supply and ammeter connected to the battery terminals of the radio. All tuning slugs except those in the oscillator coils, such as L101 and L201 (reference designations of these coils vary with model - see your applicable schematic diagram) should be unscrewed so that they are flush with the printed circuit board.
3. Connect a wattmeter to the antenna contact using the test cable.

FREQUENCY CALCULATIONS

$f_o = \frac{f_c}{9}$ where: f_o = oscillator frequency and f_c = carrier frequency

Transmitter Metering And Alignment Points

STEP	TEST EQUIPMENT	METER POINT	ADJUSTMENT	PROCEDURE
11	RF wattmeter and Ammeter	----	L109 L107	Tune L109 out of the board until the current drain decreases to about 330** mA. Then tune L107 for maximum power output and minimum current drain.
12	RF wattmeter and Ammeter	----	L111 L112	Tune L112 and L111 for best power output and minimum current drain as follows: First increase the power output by tuning L112, and then tune L111 until 1.8 watts power output is obtained. If the current drain is greater than 310** mA, retune L112 and then tune L111. NOTE: It may be necessary to readjust L109 while adjusting L111 and L112 for rated power output at the 310** mA current drain specification. TRANSMITTERS WITH TWO OR MORE FREQUENCIES ONLY To balance tune the transmitter, switch between the two most widely separated channels while tuning L107 and L109 for 1.8 W at 310** mA if the frequency separation is 1.0 MHz or less. Tune for 1.4 W at 310** mA on each channel if the frequency separation is between 1.0 MHz and 1.6 MHz.
13	----	----	----	DEVIATION CHECK: See "IDC" ADJUSTMENT procedure on the reverse side of this chart for adjusting the IDC control (R119).

*Reference designations L101 and L201 (for oscillator coils) may vary with model and number of frequencies. See your applicable schematic diagram for correct reference designations.

**Add 20 mA for remote or universal speaker/microphone models. Add 5 mA for "Private-Line" models.

NOTE

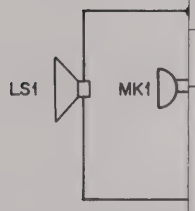
The NKD6001B Tune-up Cable must be used when aligning transmitter into a 50-ohm wattmeter in order to simulate the actual impedance of the antenna. Reduced radiated power will result if the radio is tuned directly into the wattmeter without the tune-up cable.

STEP	TEST EQUIPMENT	METER POINT	ADJUSTMENT	PROCEDURE
1	----	----	----	OSCILLATOR: L101* is preset to the assigned frequency at the factory. Do not readjust L101 unless the crystal is replaced or the setting was accidentally changed. If it is necessary to readjust L101, use the frequency meter to adjust L101 for zero reading. TRANSMITTERS WITH TWO OR MORE FREQUENCIES ONLY OSCILLATOR NO. 2, 3, 4, 5, and 6 (as applicable): Use the same procedure as above, substituting L201, etc.* for L101.
2	----	----	----	Adjust power supply voltage for 15.0 V.
3	DC Multimeter	M11	L101 L201 Etc.*	NOTE: See step 1 above before performing this step. Tune L101 for a dip. If applicable, switch to F2 through F6 and tune L201, etc.* for a dip.
4	DC Multimeter	M12	L103 L104	Tune L103 and L104 for a maximum reading. Retune these coils at least once to insure that a maximum has been obtained. This circuit is tuned to three times the crystal frequency.
5	DC Multimeter	M12	L105	Tune L105 for a dip in the meter reading. This circuit is tuned to nine times the crystal frequency.
6	RF wattmeter and NKD6001B Tune-Up Cable	----	L106 L107 L109 L111 L112	Tune L106 for maximum power output; then tune for maximum power output in pairs as follows: Tune L107 for maximum power output, then L109, then repeak L107. Repeat for L111 and L112.
7	RF wattmeter and NKD6001B Tune-Up Cable	----	L105 L106	Repeak L105 and L106 for maximum power output.
8	RF wattmeter, NKD6001B Tune-up Cable	----	L107 L109 L111 L112	Repeak L107 and L109 for maximum power output, then repeat, using L111 and L112.
9	RF wattmeter, Ammeter, and NKD6001B Tune-Up Cable	----	L112	Tune L112 until the current drain decreases to a current dip point. When this point is reached, adjust L112 until the total current drain is slightly above the minimum obtained in the dip and the power output is above that which occurs at the current dip. NOTE: If a current dip cannot be obtained, tune L112 until the current decreases and the power output is about 2.25 watts.
10	RF wattmeter	----	L111	Tune L111 into the board until the power output is about 2.0 watts.

PARTS LIST

MN6041B & NMN6042B Remote Speaker and Microphone EPD-24882-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L1	24D82723H01	COIL, RF: choke; 1.2 uH
LS1	50D83466D02	SPEAKER, dynamic: 2" dia.; coil impedance 39 ohms
MK1		MICROPHONE, dynamic: res 630 ohms; impedance 3500 ohms (not field repairable; for replacement, order front cover assy below)
P1	9B84039H01	CONNECTOR, plug: female; 4 req'd; does not include 15B84038H02 SHROUD
S1	40B82159D01	SWITCH: spdt; P-T-T
NON-REFERENCED ITEM		
	1V80701C48	FRONT COVER ASSY; includes LS1 & MK1



Models NMN6041B & NMN6042B
Remote Speaker & Microphone
Schematic Diagram
Motorola No. 63B81068A48-O1
11/15/71-CP

"IDC" ADJUSTMENT PROCEDURE

1. INTRODUCTION

An accurate means of measuring transmitter deviation is to use the Motorola S1325A Digital Frequency Meter/Deviation Meter or Motorola S1327AA Service Monitor or S1059A Portable Test Set (including deviation meter and peaking generator). Any of these units, properly used, permits accurate measurement and setting of transmitter deviation via a peak-reading meter that is unaffected by waveform. An oscilloscope is not required. With these devices, transmitter deviation can be measured accurately, even with voice modulation.

The following procedure will insure that the transmitter complies with FCC requirements of maximum deviation.

The importance of correct deviation cannot be overemphasized. Optimum system performance demands accurate deviation setting since overdeviation will interfere with the user on the adjacent channel, and underdeviation may reduce system range.

2. TEST EQUIPMENT REQUIRED

a. Motorola S1325A Digital Frequency Meter/Deviation Meter or Motorola S1327A A Service Monitor, Motorola S1059A Portable Test Set (including deviation meter and peaking generator), or equivalent.

b. Motorola S1051C Solid State AC Voltmeter (battery power supply), Motorola S1053C Solid State AC Voltmeter (battery/117 V ac power supply), or equivalent.

c. Motorola TEK-1A Transistorized Tone Oscillator or equivalent.

3. SETTING TRANSMITTER DEVIATION (CARRIER SQUELCH MODELS)

a. Apply a 0.015 volt rms (1000 Hz) signal at the microphone terminal and set the IDC control on the transmitter to provide ±5 kHz transmitter deviation.

b. On two or more frequency transmitters, set the deviation by adjusting the IDC control on the frequency which produces the highest deviation. When deviation is checked on all other frequencies, it should be no less than ±4 kHz nor more than ±5 kHz.

c. Reduce the 1000 Hz input signal until the deviation is ±3.3 kHz. Observe the input signal level. It shall be less than 7.7 mV.

4. SETTING TRANSMITTER DEVIATION ("PRIVATE-LINE" MODELS)

a. Remove the "PL" reed.

b. Apply a 0.015 volt rms (1000 Hz) signal at the microphone terminal and set the IDC control on the transmitter to provide ±4 kHz transmitter deviation.

c. Reduce the 1000 Hz input signal until the deviation is ±2.7 kHz. Observe the input signal level. It shall be less than 7.7 mV.

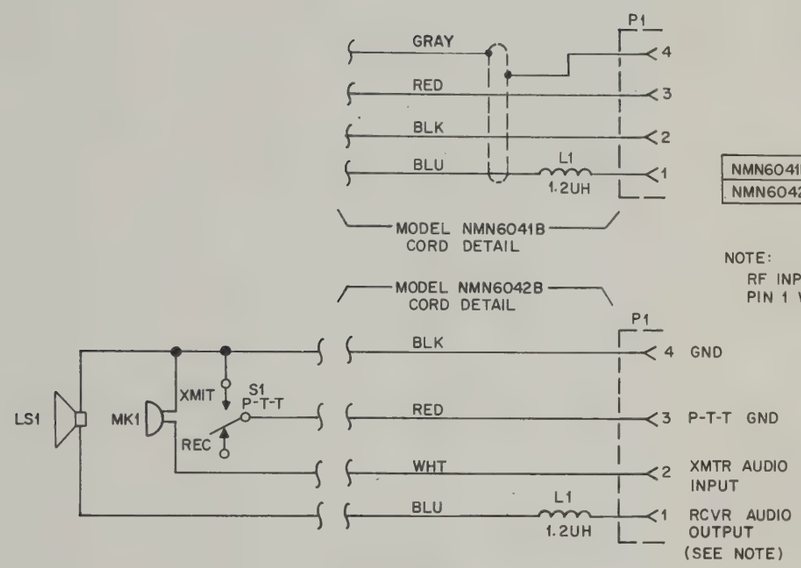
d. Reinsert the "PL" reed and adjust the "PL" deviation control to provide a total of ±5 kHz transmitter deviation.

e. Remove the 1000 Hz input signal and check "PL" deviation. "PL" deviation should be ±0.5 kHz minimum, ±1.0 kHz maximum.

f. On two or more frequency transmitters, set the deviation by adjusting the IDC control on the frequency which produces the highest deviation. When total deviation is checked on all other frequencies, it should be no less than ±4 kHz nor more than ±5 kHz.

5. EMERGENCY MEASUREMENT OF DEVIATION

If an audio oscillator is not available, a loud sustained whistle of approximately 1000 Hz can be used for a rough measurement of deviation. If this rough check indicates the need for resetting deviation, do so only under controlled conditions, applying a 1000 Hz tone as previously indicated.



63B81068A48-01

MODELS		
NMN6041B	SPEAKER & MICROPHONE	STRAIGHT CORD
NMN6042B	SPEAKER & MICROPHONE	COILED CORD

NOTE:
RF INPUT/OUTPUT SIGNAL ALSO PRESENT AT PIN 1 WHEN UNIT USED WITH VHF MODEL RADIOS.

P1 DETAIL
SOCKET
SIDE

PARTS LIST

NMN6041B & NMN6042B Remote Speaker and Microphone EPD-24882-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L1	24D82723H01	COIL, RF: choke; 1.2 uH
LS1	50D83466D02	SPEAKER, dynamic: 2" dia.; coil impedance 39 ohms
MK1		MICROPHONE, dynamic: res 630 ohms; impedance 3500 ohms (not field repairable; for replacement, order front cover assy below)
P1	9B84039H01	CONNECTOR, plug: female; 4 req'd; does not include 15B84038H02 SHROUD
S1	40B82159D01	SWITCH: spdt; P-T-T
NON-REFERENCED ITEM		
	1V80701C48	FRONT COVER ASSY; includes LS1 & MK1

Models NMN6041B & NMN6042B
Remote Speaker & Microphone
Schematic Diagram
Motorola No. 63B81068A48-01
11/15/71-CP

PARTS LIST

NMN6041B & NMN6042B Speaker & Microphone EPD-24884-B

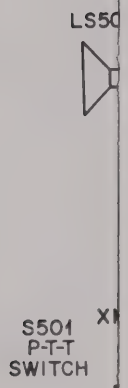
REF. NO.	NOMENCLATURE	MOTOROLA PART NUMBER	QUANTITY USED
1	SCREW, captive	3A82210E03	4
2	WASHER, nylon	4C82418B09	4
3	FRONT COVER ASSY, incl ref. no. 4 & 5 below	1V80701C48	1
4	NAMEPLATE	33B84178H01	1
5	SPEAKER, dynamic	(See LS1 on spkr & mic parts list)	1
6	PAD, rubber	75A82200H10	1
7	SCREW (2-56 x 5/16"), Phillips round hd.	3S136271	1
8, 12	WASHER, #2, internal	4S8406	2
9	SWITCH, sensitive	(See S1 on spkr & mic parts list)	1
10	SOLDER LUG, #4	29R5369	1
11	SCREW (2-56 x 5/16"), tpg type, Phillips pan hd.	3S136914	1
13	BUTTON, push	38B84414H01	1
14	SPRING, actuator	41B84491H01	1
15	SCREW (4-40 x 3/16"), Phillips binder hd.	3S120619	1
16	WASHER, #4, internal	4S7683	1
17	CLAMP, cable	42B84409H01	1
18	SOLDER LUG, #6 (used on NMN6041B only)	29R5360	1
19, 31	STRAIN RELIEF	37B84320H01	2
20	WASHER, "E" spring	4B84734H01	1
21	SCREW, captive	3A84036H01	1
22	SCREW (2-56 x 1/4"), Phillips round hd.	3S132342	1
23	WASHER (.096" ID, .156" OD, .024" thk), flat	4S124634	1
24	CHOKE	(See L1 on spkr & mic parts list)	1
25	RECEPTACLE	(p/o P1 - see spkr & mic parts list)	4
26	SHROUD	(p/o P1 - see spkr & mic parts list)	1
27	SOLDER LUG, #6 (used on NMN6041B) 1 req'd	29R5360	1
	or WASHER, fiber (used on NMN6042B) 1 req'd	4C82418B89	1
28	SCREW (2-56 x 3/8"), Phillips pan hd.	3S136745	1
29	NUT (#2-56), hex	2S7041	1
30	CLAMP	42B84483H01	2
32	COVER, receptacle	15C84035H03	1
33	CORD, straight, 3 conductor, shielded (used on NMN6041B)	30B84048H02	42"
	or CORD, coiled, 4 conductor, (used on NMN6042B)	30B84123H02	1

PARTS LIST

NMN6048B & NMN6049B External Speaker & Microphone

EPD-25041-A

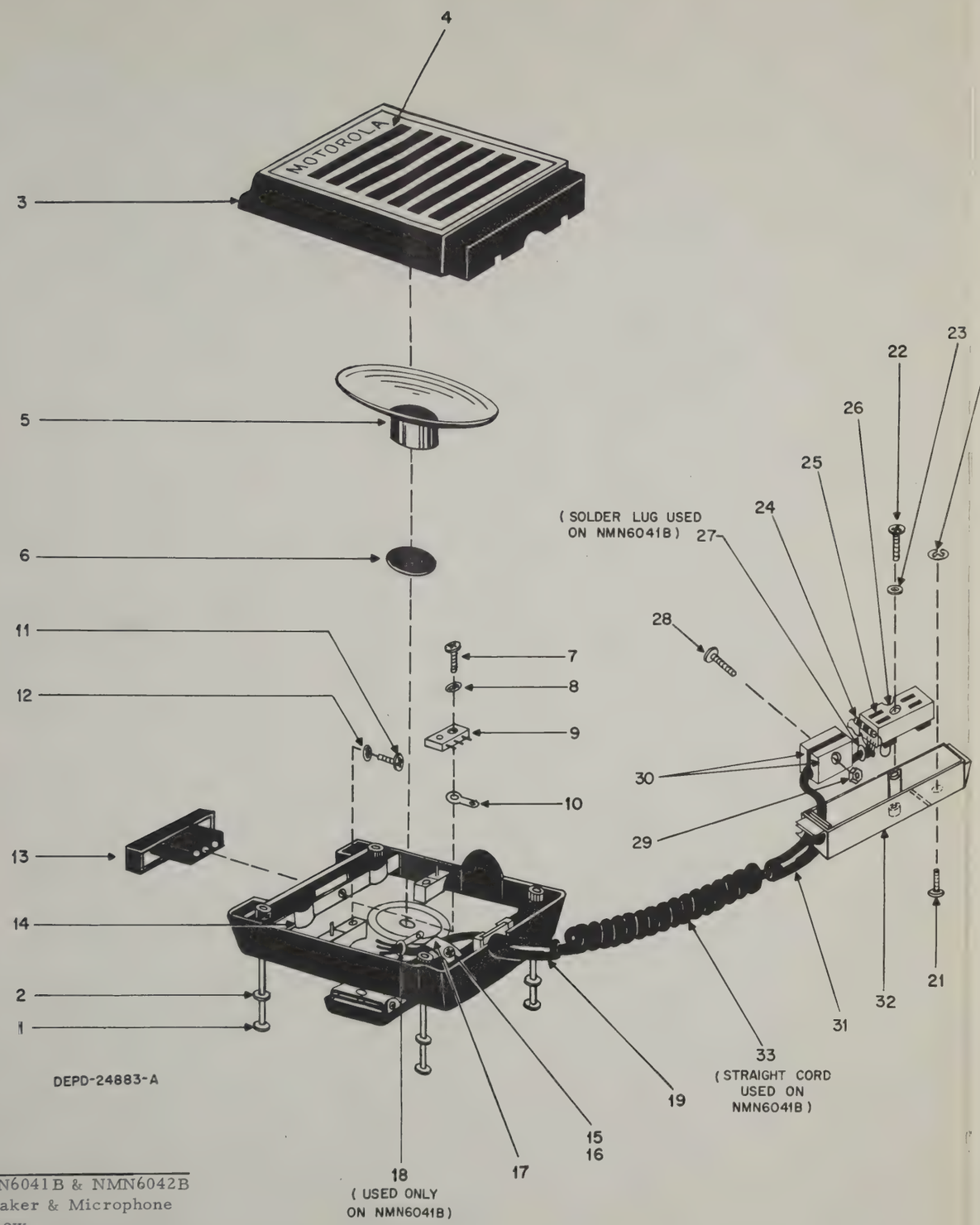
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C501, 502	23D84762H09	CAPACITOR, fixed: 15 uF ±20%; 20 V
LS501	50D83466D02	SPEAKER, dynamic: 2" dia. coil; impedance 39 ohms
MK501		MICROPHONE, dynamic: res 630 ohms: impedance 3500 ohms (not field repairable; for replacement order front cover assy below)
P501	9B84039H01	CONNECTOR, plug: female; 4 req'd; does not include 15B84038H01 SHROUD
R501	6S131594	RESISTOR, fixed: 27 Ω ±10%; 1/4 W
S501	40B82159D01	SWITCH: spdt; P-T-T
NON-REFERENCED ITEM		
	1V80702C20	FRONT COVER ASSY; includes LS501, MK501



REVISIONS

CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
NMN6048B, NMN6049B		MINOR CHANGES IN PARTS LIST FORMAT	PARTS LIST	NONE

Models NMN6048B & NMN6049B
External (Universal) Speaker & Microphone
Schematic Diagram
Motorola No. 63C81062A64-O1
11/15/71-CP

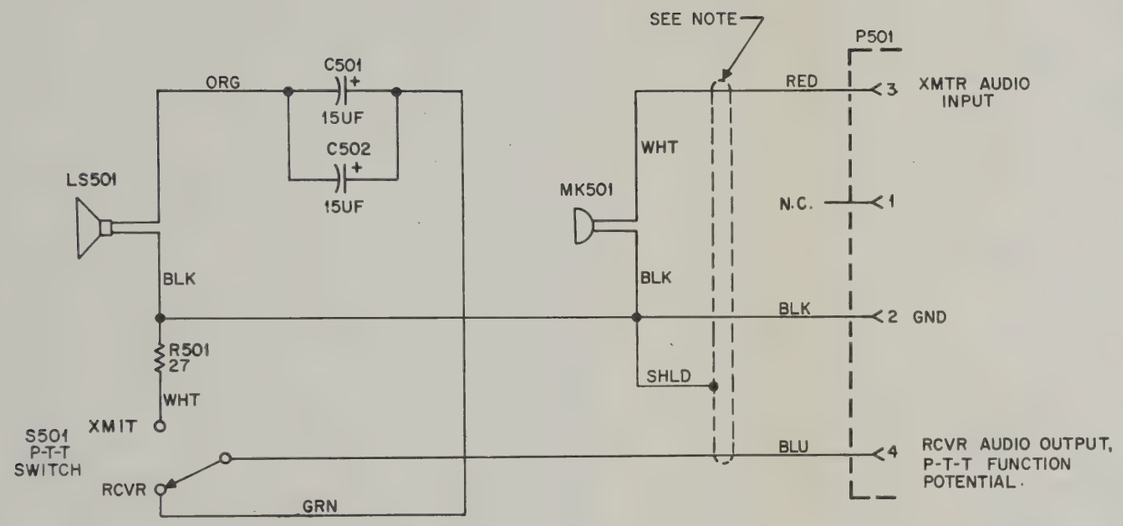


Models NMN6041B & NMN6042B
Remote Speaker & Microphone
Exploded View
Motorola No. PEPD-24885-B
11/15/71-CP

PARTS LIST

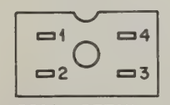
NMN6041B & NMN6042B Speaker & Microphone EPD-24884-B

REF. NO.	NOMENCLATURE	MOTOROLA PART NUMBER	QUANTITY USED
1	SCREW, captive	3A82210E03	4
2	WASHER, nylon	4C82418B09	4
3	FRONT COVER ASSY, incl ref. no. 4 & 5 below	1V80701C48	1
4	NAMEPLATE	33B84178H01	1
5	SPEAKER, dynamic	(See LS1 on spkr & mic parts list)	1
6	PAD, rubber	75A82200H10	1
7	SCREW (2-56 x 5/16"), Phillips round hd.	3S136271	1
8, 12	WASHER, #2, internal	4S8406	2
9	SWITCH, sensitive	(See S1 on spkr & mic parts list)	1
10	SOLDER LUG, #4	29R5369	1
11	SCREW (2-56 x 5/16"), tpg type, Phillips pan hd.	3S136914	1
13	BUTTON, push	38B84414H01	1
14	SPRING, actuator	41B84491H01	1
15	SCREW (4-40 x 3/16"), Phillips binder hd.	3S120619	1
16	WASHER, #4, internal	4S7683	1
17	CLAMP, cable	42B84409H01	1
18	SOLDER LUG, #6 (used on NMN6041B only)	29R5360	1
19,31	STRAIN RELIEF	37B84320H01	2
20	WASHER, "E" spring	4B84734H01	1
21	SCREW, captive	3A84036H01	1
22	SCREW (2-56 x 1/4"), Phillips round hd.	3S132342	1
23	WASHER (.096" ID, .156" OD, .024" thk), flat	4S124634	1
24	CHOKE	(See L1 on spkr & mic parts list)	1
25	RECEPTACLE	(p/o P1 - see spkr & mic parts list)	4
26	SHROUD	(p/o P1 - see spkr & mic parts list)	1
27	SOLDER LUG, #6 (used on NMN6041B) 1 req'd or WASHER, fiber (used on NMN6042B) 1 req'd	29R5360 4C82418B89	1 1
28	SCREW (2-56 x 3/8"), Phillips pan hd.	3S136745	1
29	NUT (#2-56), hex	2S7041	1
30	CLAMP	42B84483H01	2
32	COVER, receptacle	15C84035H03	1
33	CORD, straight, 3 conductor, shielded (used on NMN6041B) or CORD, coiled, 4 conductor, (used on NMN6042B)	30B84048H02 30B84123H02	42" 1



MODELS

NMN6048B	SPEAKER & MICROPHONE	STRAIGHT CORD
NMN6049B	SPEAKER & MICROPHONE	COILED CORD



P501 DETAIL
SOCKET SIDE

NOTE:
CABLE SHIELD ON NMN6048B MODEL ONLY.

63C81062A64-01

PARTS LIST

NMN6048B & NMN6049B External Speaker & Microphone

EPD-25041-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C501, 502	23D84762H09	CAPACITOR, fixed: 15 uF ±20%; 20 V
LS501	50D83466D02	SPEAKER, dynamic: 2" dia. coil; impedance 39 ohms
MK501		MICROPHONE, dynamic: res 630 ohms: impedance 3500 ohms (not field repairable; for replacement order front cover assy below)
P501	9B84039H01	CONNECTOR, plug: female; 4 req'd; does not include 15B84038H01 SHROUD
R501	6S131594	RESISTOR, fixed: 27 Ω ±10%; 1/4 W
S501	40B82159D01	SWITCH: spdt; P-T-T
NON-REFERENCED ITEM		
	1V80702C20	FRONT COVER ASSY; includes LS501, MK501

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
01	NMN6048B, NMN6049B		MINOR CHANGES IN PARTS LIST FORMAT	PARTS LIST	NONE

Models NMN6048B & NMN6049B
External (Universal) Speaker & Microphone
Schematic Diagram
Motorola No. 63C81062A64-01
11/15/71-CP

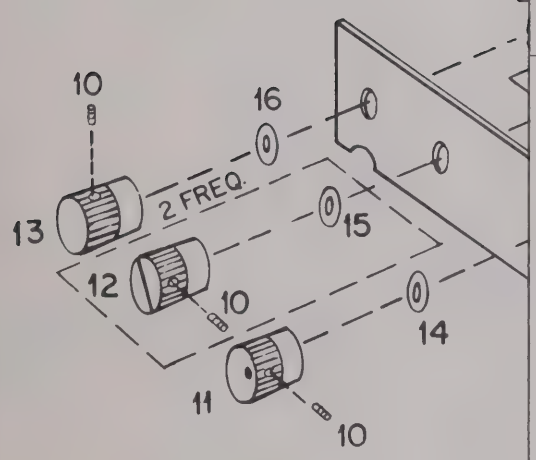
PARTS LIST

NMN6048B & NMN6049B External Speaker & Microphone EPD-24988-A

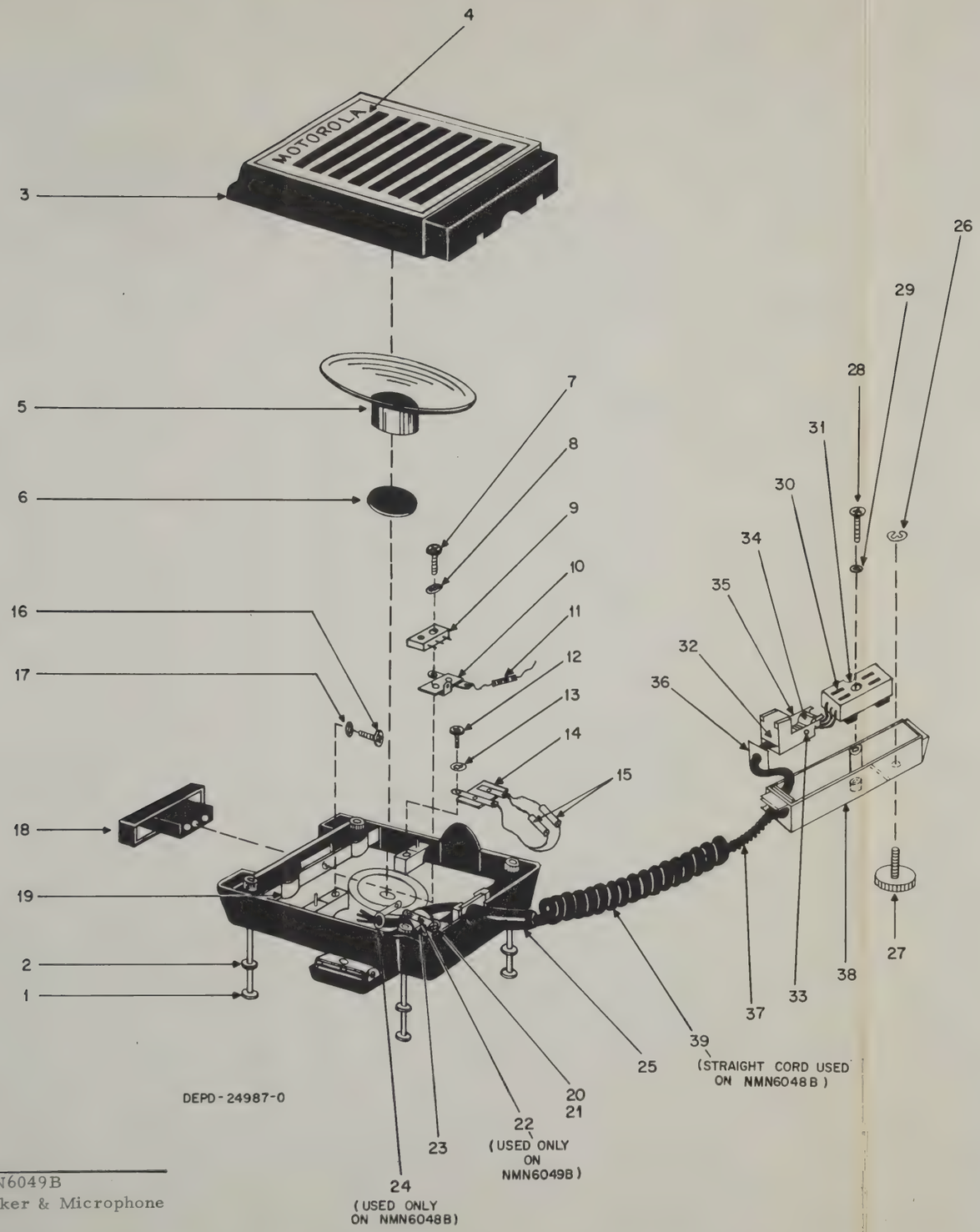
REF. NO.	NOMENCLATURE	MOTOROLA PART NUMBER	QUANTITY USED
1	SCREW, captive	3A82210E03	4
2	WASHER, nylon	4C82418B09	4
3	FRONT COVER ASSY, incl ref. no. 4 & 5 below	1V80702C20	1
4	NAMEPLATE	33B84178H01	1
5	SPEAKER, dynamic	(See LS501 on spkr & mic parts list)	1
6	PAD, rubber	75A82200H10	1
7	SCREW (2-56 x 5/16"), Phillips round hd.	3S136271	1
8, 13, 17	WASHER, #2, internal	4S8406	3
9	SWITCH, sensitive	(See S501 on spkr & mic parts list)	1
10, 14	TERMINAL, strip	31S125063	2
11	RESISTOR	(See R501 on spkr & mic parts list)	1
12	SCREW (2-56 x 1/8"), Phillips round hd.	3S136915	1
15	CAPACITOR	(See C501, 502 on spkr & mic parts list)	2
16	SCREW (2-56 x 5/16"), tpg type, Phillips pan hd.	3S136914	1
18	BUTTON, push	38B84414H01	1
19	SPRING, actuator	41B84491H01	1
20	SCREW (4-40 x 3/16"), Phillips binder hd. (used on NMN6048B only)	3S120619	1
	or SCREW (4-40 x 1/4"), Phillips binder hd. (used on NMN6049B only)	3S120621	1
21	WASHER, #4, internal	4S7683	1
22	SOLDER LUG, #4 (used on NMN6049B only)	29S5222	1
23	CLAMP, cable	42B84409H01	1
24	SOLDER LUG, #6 (used on NMN6048B only)	29R5360	1
25	STRAIN RELIEF	37B84320H01	1
26	WASHER, "E" spring	4B84734H01	1
27	SCREW, thumb	3B84272H03	1
28	SCREW (2-56 x 1/4"), Phillips round hd.	3S132342	1
29	WASHER (.096" ID, .156" OD, .024" thk, flat	4S124634	1
30	RECEPTACLE	(See P501 on spkr & mic parts list)	4
31	SHROUD	(See P501 on spkr & mic parts list)	1
32	MAGNET	59B84283H01	1
33	PIN, CLAMP	22A84281H01	1
34	CLAMP, cable	42B84282H01	1
35	BRACKET, cable	7C84293H01	1
36	INSULATOR, nylon	14A84212H01	1
37	SPRING, strain relief	41B84037H03	1
38	COVER, receptacle	15C84035H03	1
39	CORD, straight, 3 conductor, shielded (used on NMN6048B)	30B84048H02	48"
	or CORD, coiled, 3 conductor (used on NMN6049B)	30B84123H03	1

REF. NO.	NOMENCLATURE	MOTOROLA PART NO.	QUANTITY USED
1	Pin, Lever Actuating	22B82591C10	1
2	Lever, Actuating	36C83129H01	1
3	Spring	41A82680D03	1
4	Sleeve, Switch	43A83569H01	1
5	Switch Actuator Assembly, includes the following:	1V80792A34	1
5A	Button, Male	38C83130H01	1
5B	Spring, Compression	41A83567H01	1
5C	Button, Female	38C83130H02	1
6	Nut, Special	2A83570H01	1
7	Switch, Push-To-Talk	1V80786A90 (S3)	1
8	Screw (2-56 x 1/4 Phillips Head)	3S136666	2
9	Bushing, Cover Mounting	43B83578H01	2
10	Setscrew, Special (4-40 x 1/8)	3A83174C02	2 (1f) or 3 (2f)
11	Knob, Control (Volume & On-Off)	36B83573H01	1
12	Knob, Switch (Freq.)	36B83573H03 (2f)	1
13	Knob, Control (Squelch)	36B83573H05	1
14, 15, 16	Washer, Nylon (item 15 for 2f only)	4A82418B97	2 (1f) or 3 (2f)
17	Escutcheon	13C83548H03 (1f) or 13C83548H02 (2f)	1 1
18, 23	Nut, Special (1/4-32)	2A82653D03	2
24	Washer, Nylon (.343-245/250)	4A82453E01	2
20	Control, Volume & On-Off Switch	(See R31 & S2 on RCVR parts list)	1
21	Nut, Special (1/4-28)	2A82653D05 (2f)	1
21A	Pad	75A83562H01 (1f)	1
22	Switch, Freq.	(See S1 on RCVR parts list) (2f)	1
25	Control, Squelch	(See R40 on RCVR parts list)	1
26	Terminal, Grounding	29B83549H01	1
27	Frame	7D83124H01	1

NOTE:
All parts are common to one frequency (1f) and two frequency (2f) chassis frames, except where indicated otherwise in Motorola part no. column.



Exploded View of Radio Chassis
Typical Carrier Squelch, Internal Speaker/Microphone Model
Motorola No. CEPD-22360-B
11/15/71-CP

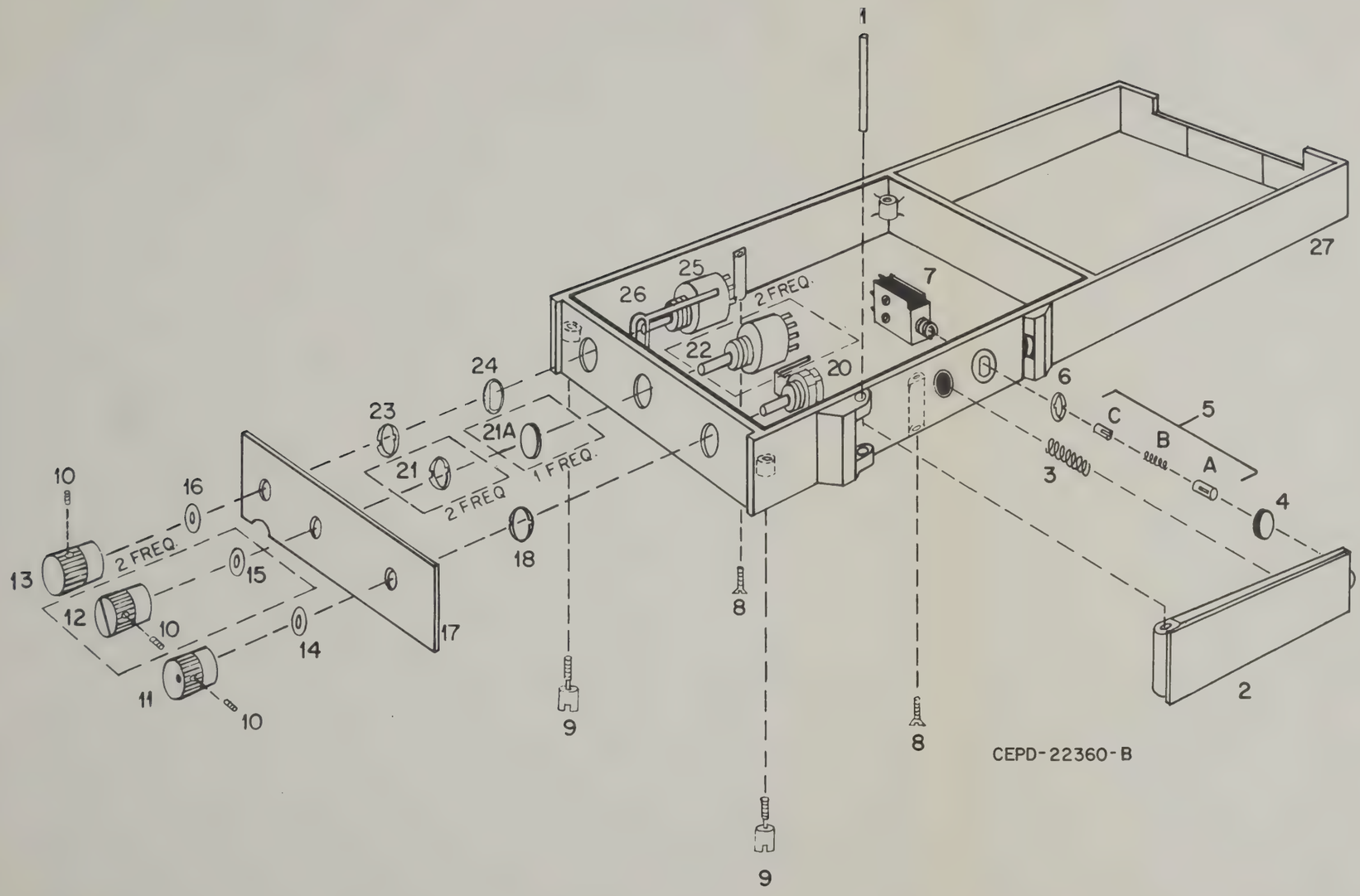


Models NMN6048B & NMN6049B
External (Universal) Speaker & Microphone
Exploded View
Motorola No. PEPD-24990-O1
11/15/71-CP

PARTS LIST

NMN6048B & NMN6049B External Speaker & Microphone EPD-24988-A

REF. NO.	NOMENCLATURE	MOTOROLA PART NUMBER	QUANTITY USED
1	SCREW, captive	3A82210E03	4
2	WASHER, nylon	4C82418B09	4
3	FRONT COVER ASSY, incl ref. no. 4 & 5 below	1V80702C20	1
4	NAMEPLATE	33B84178H01	1
5	SPEAKER, dynamic	(See LS501 on spkr & mic parts list)	1
6	PAD, rubber	75A82200H10	1
7	SCREW (2-56 x 5/16"), Phillips round hd.	3S136271	1
8, 13, 17	WASHER, #2, internal	4S8406	3
9	SWITCH, sensitive	(See S501 on spkr & mic parts list)	1
10, 14	TERMINAL, strip	31S125063	2
11	RESISTOR	(See R501 on spkr & mic parts list)	1
12	SCREW (2-56 x 1/8"), Phillips round hd.	3S136915	1
15	CAPACITOR	(See C501, 502 on spkr & mic parts list)	2
16	SCREW (2-56 x 5/16"), tpg type, Phillips pan hd.	3S136914	1
18	BUTTON, push	38B84414H01	1
19	SPRING, actuator	41B84491H01	1
20	SCREW (4-40 x 3/16"), Phillips binder hd. (used on NMN6048B only)	3S120619	1
	or SCREW (4-40 x 1/4"), Phillips binder hd. (used on NMN6049B only)	3S120621	1
21	WASHER, #4, internal	4S7683	1
22	SOLDER LUG, #4 (used on NMN6049B only)	29S5222	1
23	CLAMP, cable	42B84409H01	1
24	SOLDER LUG, #6 (used on NMN6048B only)	29R5360	1
25	STRAIN RELIEF	37B84320H01	1
26	WASHER, "E" spring	4B84734H01	1
27	SCREW, thumb	3B84272H03	1
28	SCREW (2-56 x 1/4"), Phillips round hd.	3S132342	1
29	WASHER (.096" ID, .156" OD, .024" thk, flat	4S124634	1
30	RECEPTACLE	(See P501 on spkr & mic parts list)	4
31	SHROUD	(See P501 on spkr & mic parts list)	1
32	MAGNET	59B84283H01	1
33	PIN, CLAMP	22A84281H01	1
34	CLAMP, cable	42B84282H01	1
35	BRACKET, cable	7C84293H01	1
36	INSULATOR, nylon	14A84212H01	1
37	SPRING, strain relief	41B84037H03	1
38	COVER, receptacle	15C84035H03	1
39	CORD, straight, 3 conductor, shielded (used on NMN6048B)	30B84048H02	48"
	or CORD, coiled, 3 conductor (used on NMN6049B)	30B84123H03	1



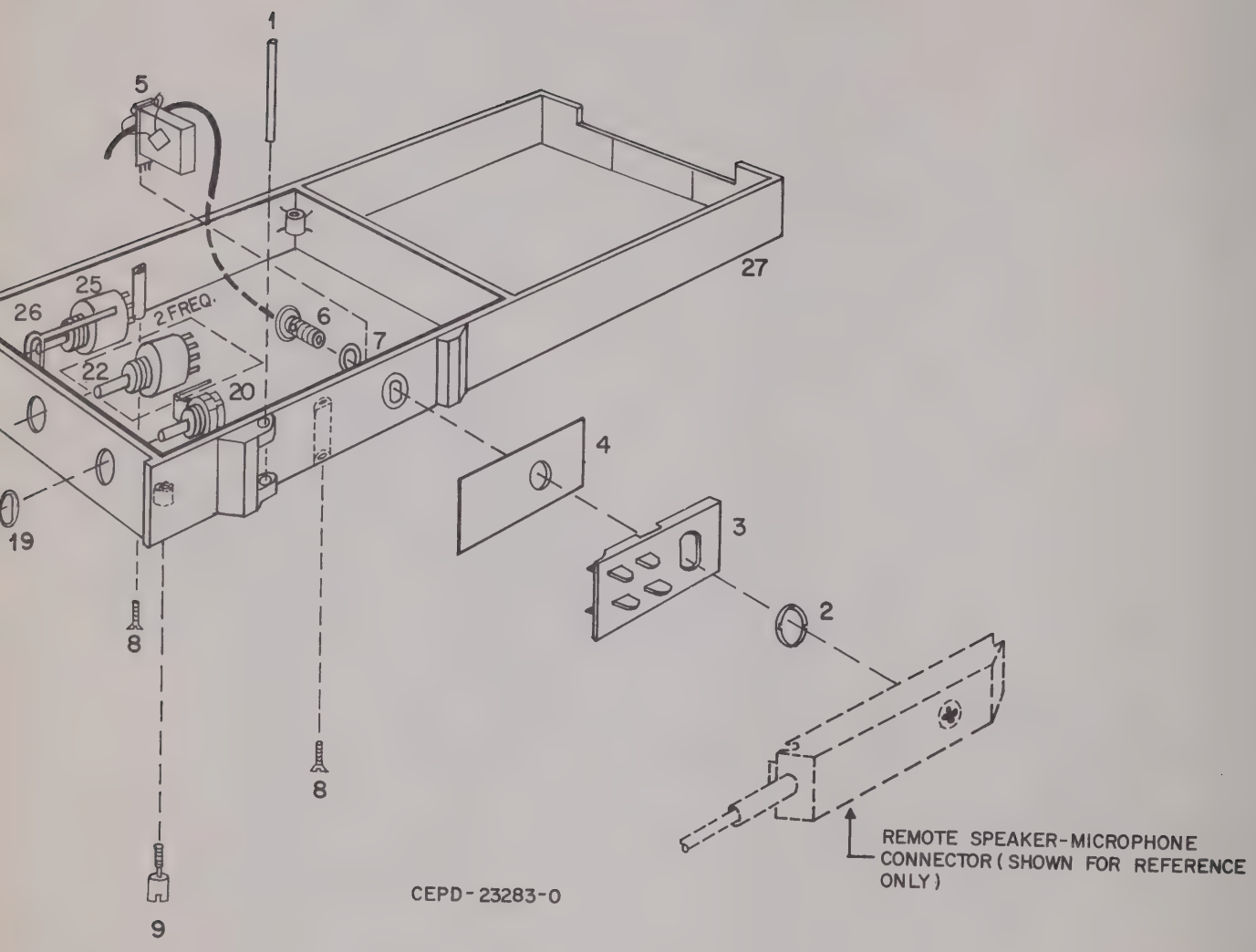
PARTS LIST

EPD-23856-A

REF. NO.	NOMENCLATURE	MOTOROLA PART NO.	QUANTITY USED
1	Pin, Lever Actuating	22B82591C10	1
2	Lever, Actuating	36C83129H01	1
3	Spring	41A82680D03	1
4	Sleeve, Switch	43A83569H01	1
5	Switch Actuator Assembly, includes the following:	1V80792A34	1
5A	Button, Male	38C83130H01	1
5B	Spring, Compression	41A83567H01	1
5C	Button, Female	38C83130H02	1
6	Nut, Special	2A83570H01	1
7	Switch, Push-To-Talk	1V80786A90 (S3)	1
8	Screw (2-56 x 1/4 Phillips Head)	3S136666	2
9	Bushing, Cover Mounting	43B83578H01	2
10	Setscrew, Special (4-40 x 1/8)	3A83174C02	2 (1f) or 3 (2f)
11	Knob, Control (Volume & On-Off)	36B83573H01	1
12	Knob, Switch (Freq.)	36B83573H03 (2f)	1
13	Knob, Control (Squelch)	36B83573H05	1
14, 15, 16	Washer, Nylon (item 15 for 2f only)	4A82418B97	2 (1f) or 3 (2f)
17	Escutcheon	13C83548H03 (1f) or 13C83548H02 (2f)	1 1
18, 23	Nut, Special (1/4-32)	2A82653D03	2
24	Washer, Nylon (. 343-245/250)	4A82453E01	2
20	Control, Volume & On-Off Switch	(See R31 & S2 on RCVR parts list)	1
21	Nut, Special (1/4-28)	2A82653D05 (2f)	1
21A	Pad	75A83562H01 (1f)	1
22	Switch, Freq.	(See S1 on RCVR parts list) (2f)	1
25	Control, Squelch	(See R40 on RCVR parts list)	1
26	Terminal, Grounding	29B83549H01	1
27	Frame	7D83124H01	1

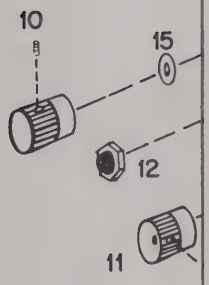
NOTE:
All parts are common to one frequency (1f) and two frequency (2f) chassis frames, except where indicated otherwise in Motorola part no. column.

Exploded View of Radio Chassis
Typical Carrier Squelch, Internal Speaker/Microphone Model
Motorola No. CEPD-22360-B
11/15/71-CP


1
5
27
25
26
2 FREQ.
6
7
22
20
4
3
19
2
8
8
9
REMOTE SPEAKER-MICROPHONE CONNECTOR (SHOWN FOR REFERENCE ONLY)

CEPD-23283-0

	NOMENCLATURE	MOTOROLA PART NO.	QTY. USED
	Pin Lever Actuating	22B82591C10	1
	Nut, Special	2A82653D05	1
	Terminal Board	(See J101 on XMTR parts list)	1
	Insulator	14B84363H01	1
	Assembly, Relay & Components	1V80791A61	1
	Bushing	43B84042H01	1
	Washer, Nylon	4A82453E01	1
	Screw (2-56 x 1/4 Phillips Head)	3S136666	2
	Bushing, Cover Mounting	43B83578H01	4
	Setscrew, Special (4-40 x 1/8)	3A83174C02	2
	Knob, Control (Volume & On-Off)	36B83573H11	1
	Nut, Boot	2B83676D01	1
	Knob, Control (Squelch)	36B83573H05	1
5	Washer, Nylon (15 for 2F only)	4A82418B97	2
	Escutcheon	13C84271H07	1
22	Nut, Special (1/4-32)	2A82653D03	2
	Washer, Nylon (.343-245/250)	4A82453E01	2
	Control, Volume & On-Off Switch	(See R31 & S2 on RCVR parts list)	1
	Nut, Special	2A82653D07	1
	Washer, Nylon	4A82453E03	1
	Switch, Toggle, "PL" On-Off	(See S4 on RCVR parts list)	1
	Control, Squelch	(See R40 on RCVR parts list)	1
	Terminal, Grounding	29B83549H01	1
	Frame	7D83342H01	1



NCE

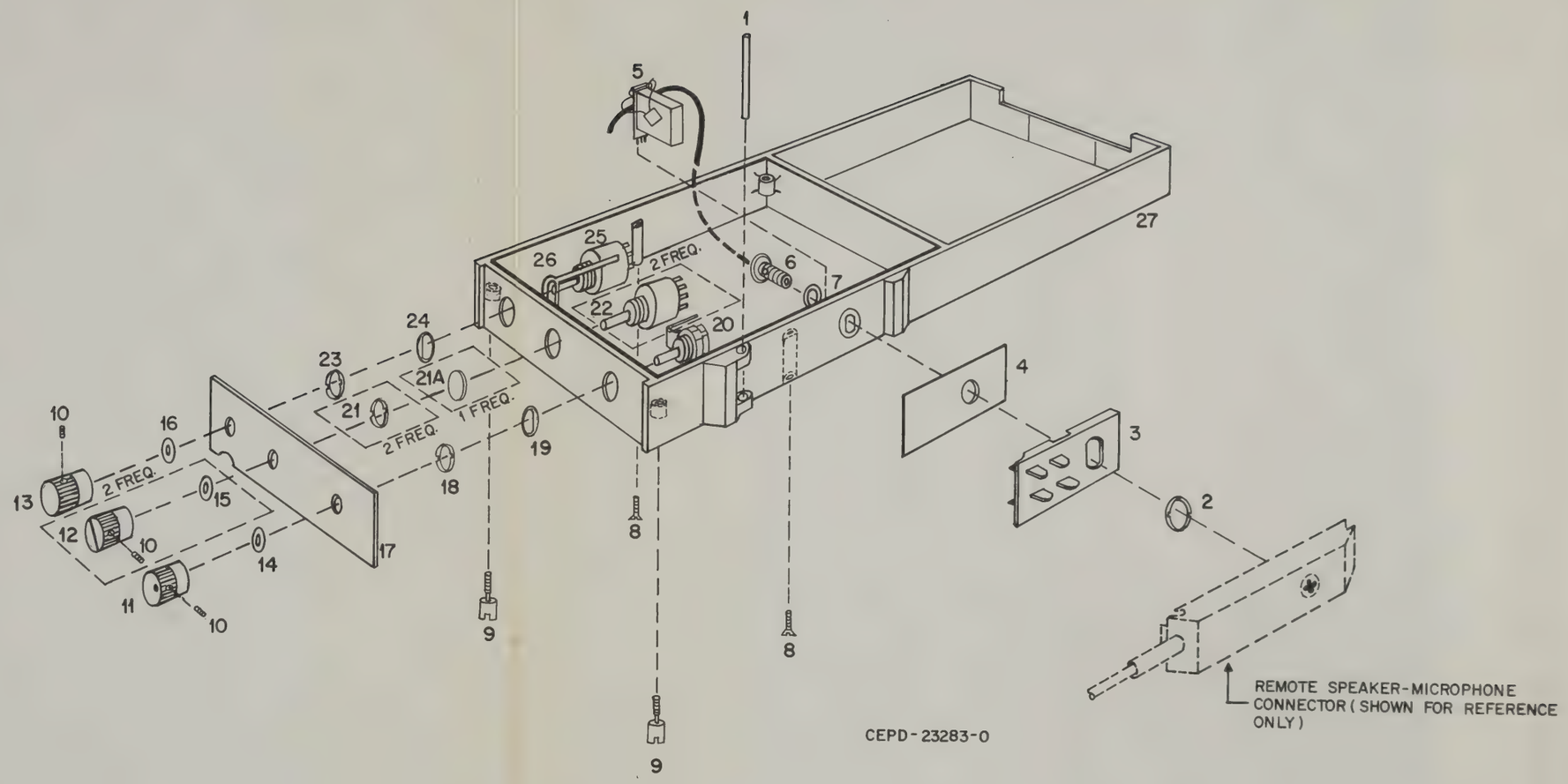
Exploded View of Radio Chassis
Typical "Private-Line" Squelch,
Universal Speaker/Microphone Model
Motorola No. CEPD-24096-A
11/15/71-CP

PARTS LIST

EPD-23284-O

REF. NO.	NOMENCLATURE	MOTOROLA PART NO.	QUANTITY USED
1	Pin, Lever Actuating	22B82591C10	1
2	Nut, Special	2A82653D05	1
3	Terminal Board	(See J101 on XMTR parts list)	1
4	Insulator	14B84363H01	1
5	Assembly, Relay & Components	1V80790A41	1
6	Bushing	43B84042H01	1
7	Washer, Nylon	4A82453E01	1
8	Screw (2-56 x 1/4 Phillips Head)	3S136666	2
9	Bushing, Cover Mounting	43B83578H01	2
10	Setscrew, Special (4-40 x 1/8)	3A83174C02	2 (1f) or3 (2f)
11	Knob, Control (Volume & On-Off)	36B83573H01	1
12	Knob, Switch (Freq.)	36B83573H03 (2f)	1
13	Knob, Control (Squelch)	36B83573H05	1
14, 15, 16	Washer, Nylon (item 15 for 2f only)	4A82418B97	2 (1f) or3 (2f)
17	Escutcheon	13C83548H03 (1f) or13C83548H02 (2f)	1 1
18, 23	Nut, Special (1/4-32)	2A82653D03	2
19, 24	Washer, Nylon (.343-245/250)	4A82453E01	2
20	Control, Volume & On-Off Switch	(See R31 & S2 on RCVR parts list)	1
21	Nut, Special (1/4-28)	2A82653D05 (2f)	1
21A	Pad	75A83562H01 (1f)	1
22	Switch, Freq.	(See S1 on RCVR parts list) (2f)	1
25	Control, Squelch	(See R40 on RCVR parts list)	1
26	Terminal, Grounding	29B83549H01	1
27	Frame	7D83124H01	1

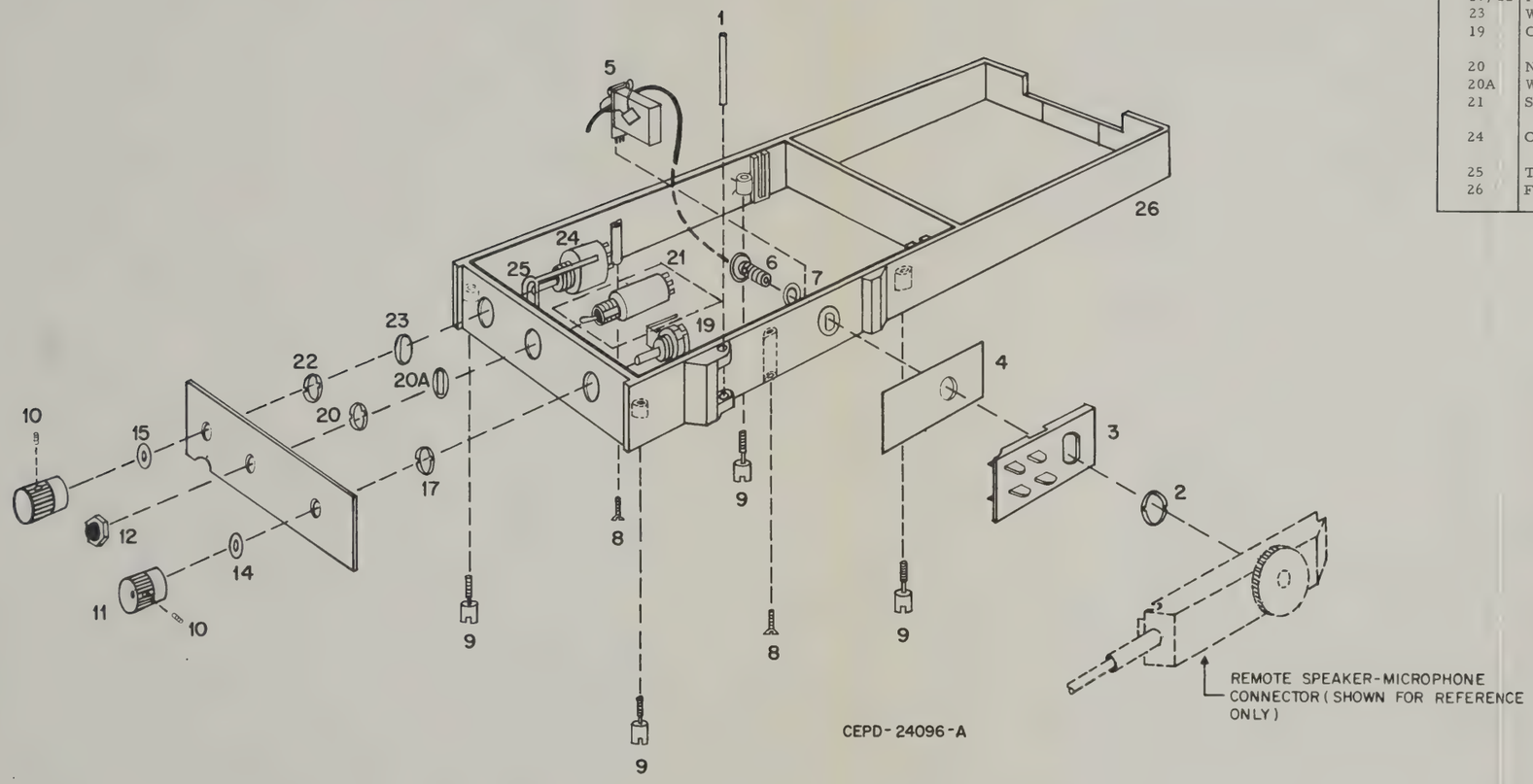
NOTE:
All parts are common to one frequency (1f) and two frequency (2f) chassis frames, except where indicated otherwise in Motorola part no. column.



CEPD-23283-O

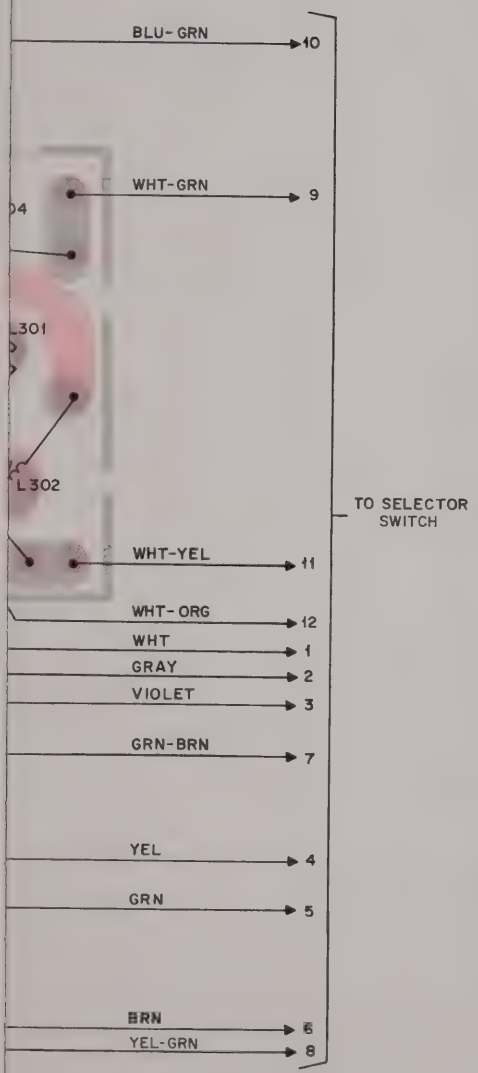
Exploded View of Radio Chassis
Typical Carrier Squelch,
Remote Speaker/Microphone Model
Motorola No. CEPD-23283-O
12/8/70-CP

REF. NO.	NOMENCLATURE	MOTOROLA PART NO.	QTY. USED
1	Pin Lever Actuating	22B82591C10	1
2	Nut, Special	2A82653D05	1
3	Terminal Board	(See J101 on XMTR parts list)	1
4	Insulator	14B84363H01	1
5	Assembly, Relay & Components	1V80791A61	1
6	Bushing	43B84042H01	1
7	Washer, Nylon	4A82453E01	1
8	Screw (2-56 x 1/4 Phillips Head)	3S136666	2
9	Bushing, Cover Mounting	43B83578H01	4
10	Setscrew, Special (4-40 x 1/8)	3A83174C02	2
11	Knob, Control (Volume & On-Off)	36B83573H11	1
12	Nut, Boot	2B83676D01	1
13	Knob, Control (Squelch)	36B83573H05	1
14,15	Washer, Nylon (15 for 2F only)	4A82418B97	2
16	Escutcheon	13C84271H07	1
17, 22	Nut, Special (1/4-32)	2A82653D03	2
23	Washer, Nylon (.343-245/250)	4A82453E01	2
19	Control, Volume & On-Off Switch	(See R31 & S2 on RCVR parts list)	1
20	Nut, Special	2A82653D07	1
20A	Washer, Nylon	4A82453E03	1
21	Switch, Toggle, "PL" On-Off	(See S4 on RCVR parts list)	1
24	Control, Squelch	(See R40 on RCVR parts list)	1
25	Terminal, Grounding	29B83549H01	1
26	Frame	7D83342H01	1

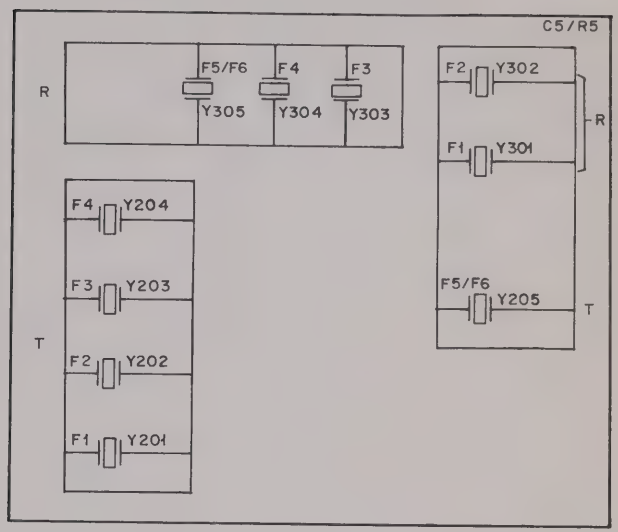


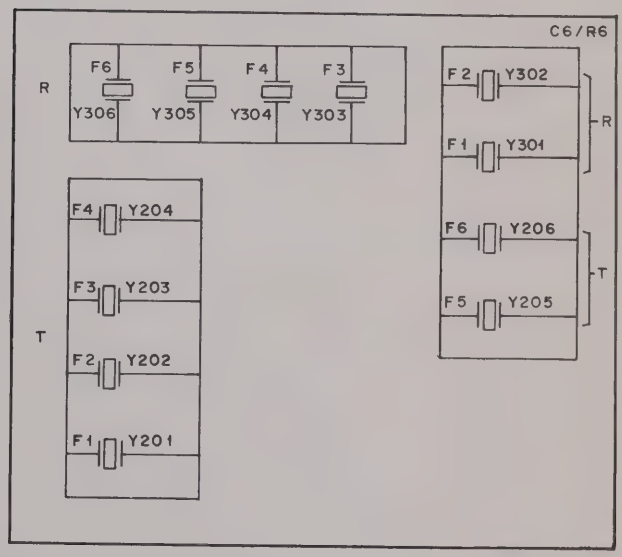
CEPD-24096-A

Exploded View of Radio Chassis
Typical "Private-Line" Squelch,
Universal Speaker/Microphone Model
Motorola No. CEPD-24096-A
11/15/71-CP



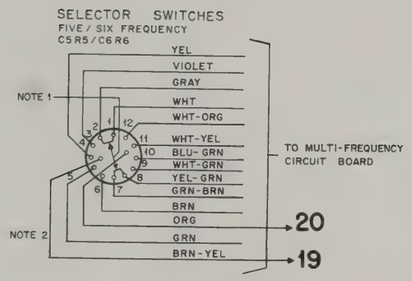
CRYSTAL LOCATION DETAILS

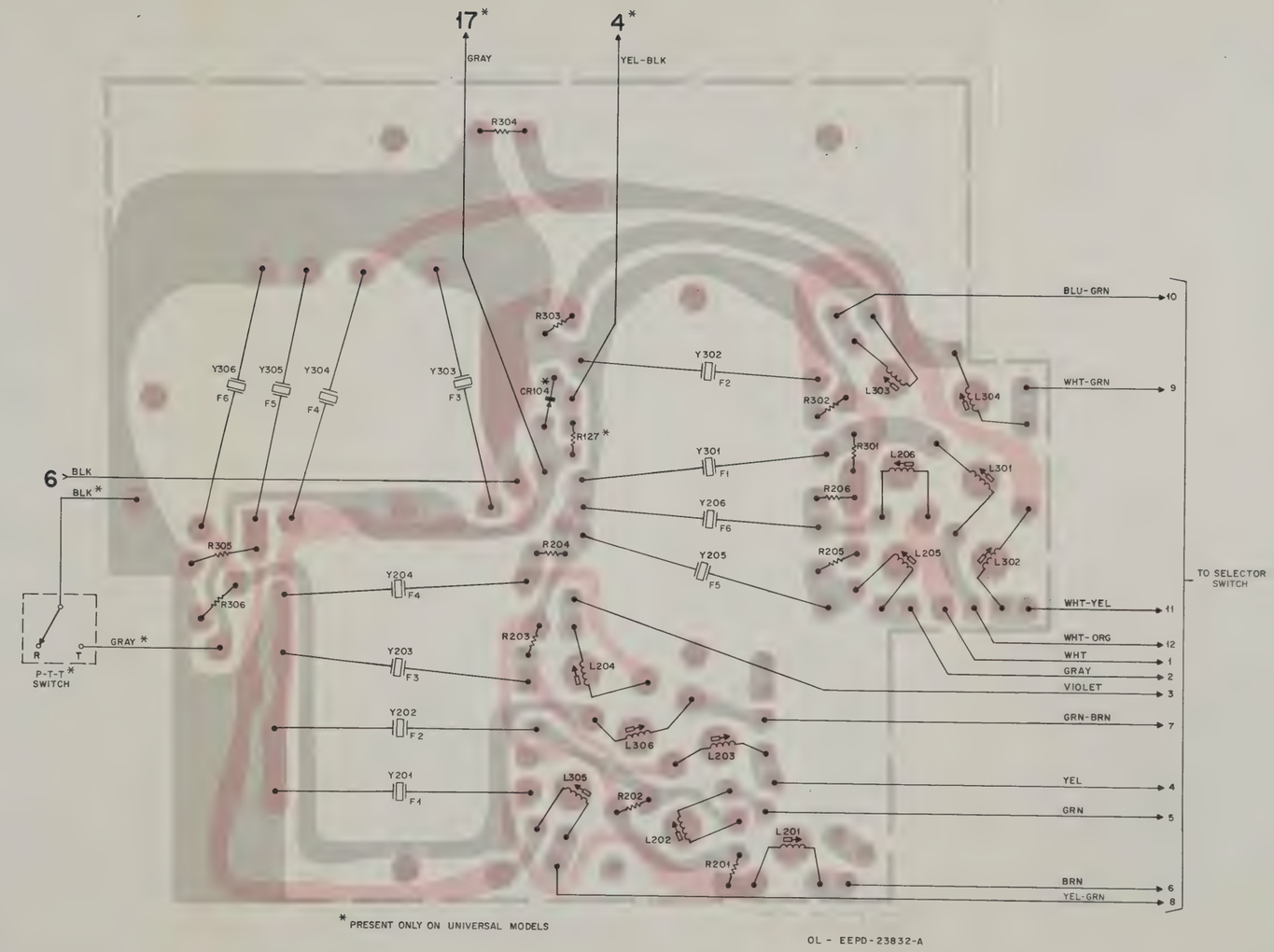




NOTES:
1. JUMPERS USED FOR FIVE-FREQUENCY OPERATION ONLY.
2. VIOLET AND WHT-GRN WIRES USED FOR SIX-FREQUENCY OPERATION ONLY.

Five & Six Frequency
Printed Circuit Board Detail
Motorola No. PEPD-23829-O
12/8/70-CP

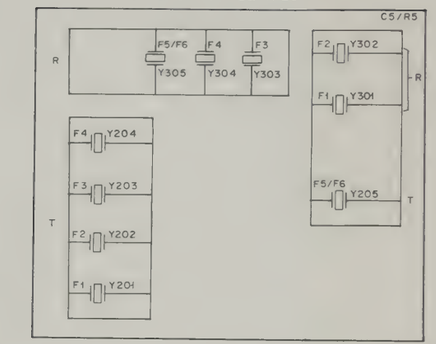


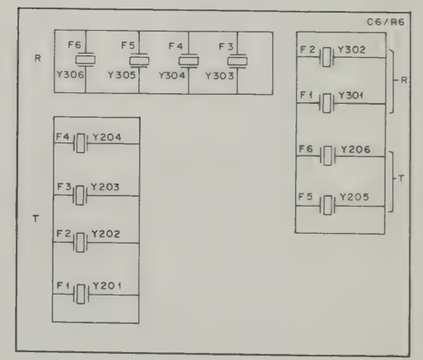


* PRESENT ONLY ON UNIVERSAL MODELS

OL - EEPD-23832-A

CRYSTAL LOCATION DETAILS

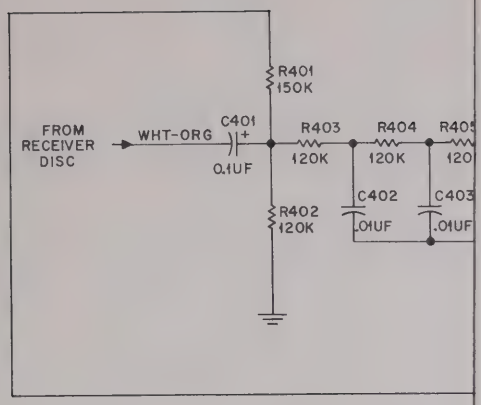




NOTES:
1. JUMPERS USED FOR FIVE-FREQUENCY OPERATION ONLY.
2. VIOLET AND WHT-GRN WIRES USED FOR SIX-FREQUENCY OPERATION ONLY.

EPD-23903-O

Five & Six Frequency
Printed Circuit Board Detail
Motorola No. PEPD-23829-O
12/8/70-CP



TEST MEASUREMENTS

PROBE POINT	DC VOLTAGES *DECODE MODE	DC VOLTAGES ENCODE+ MODE	AC VOLTAGES *DECODE MODE	AC VOLTAGES ENCODE+ MODE
TP1	3.15 V	3.15 V	17.00 mV (-33.2 dBm)	0.00 V
TP2	2.72 V	2.72 V	17.00 mV (-33.2 dBm)	0.00 V
TP3	2.58 V	2.58 V	12.50 mV (-36.0 dBm)	0.00 V
TP4	1.98 V	1.98 V	12.50 mV (-36.0 dBm)	0.00 V
IC PIN 1	6.30 V	6.30 V	-	-
IC PIN 2	5.40 V	2.80 V	0.68 V (-1.0 dBm)	0.15 V (-14.2 dBm)
IC PIN 3	0.25 V	11.00 V	-	**
IC PIN 4	1.45 V	1.65 V	75.00 mV (-20.2 dBm)	0.40 V (-5.8 dBm)
IC PIN 5	15.00 V	15.00 V	-	-
IC PIN 6	6.40 V	2.90 V	20.00 mV (-31.8 dBm)	-
IC PIN 7	7.10 V	7.00 V	-	-
IC PIN 8	0.74 V	0.30 V	2.07 mV (-51.5 dBm)	-
IC PIN 9	-	-	-	-
IC PIN 10	1.38 V	1.40 V	65.00 mV (-21.5 dBm)	0.34 V (-7.2 dBm)
IC PIN 11	0.82 V	0.80 V	67.00 mV (-21.2 dBm)	20.00 mV (-31.8 dBm)
IC PIN 12	0.05 V	0.98 V	24.00 mV (-30.2 dBm)	-
IC PIN 13	0.10 V	1.20 V	3.50 mV (-46.9 dBm)	-
IC PIN 14	0.50 V	0.75 V	5.50 mV (-42.9 dBm)	-
IC PIN 15	0.50 V	0.75 V	34.00 mV (-27.0 dBm)	-
IC PIN 16	0.08 V	15.00 V		-

*VOLTAGES MEASURED WITH 14.0 mV (-35 dBm) OF "PL" TONE AT INPUT (METER POINT M4) USING MODULATED SIGNAL GENERATOR.
**VOLTAGE WITHIN 0.0V TO 0.7 V RANGE DEPENDING UPON SETTING OF R415.
+VOLTAGES MEASURED WITH TRANSMITTER OSCILLATOR INOPERATIVE (GROUND THE TRANSMITTER CONTROL CRYSTAL(S).

EPD-23909-B

SEE TRANSMITTER DIAGRAM FOR MODEL AND SUFFIX INFORMATION.

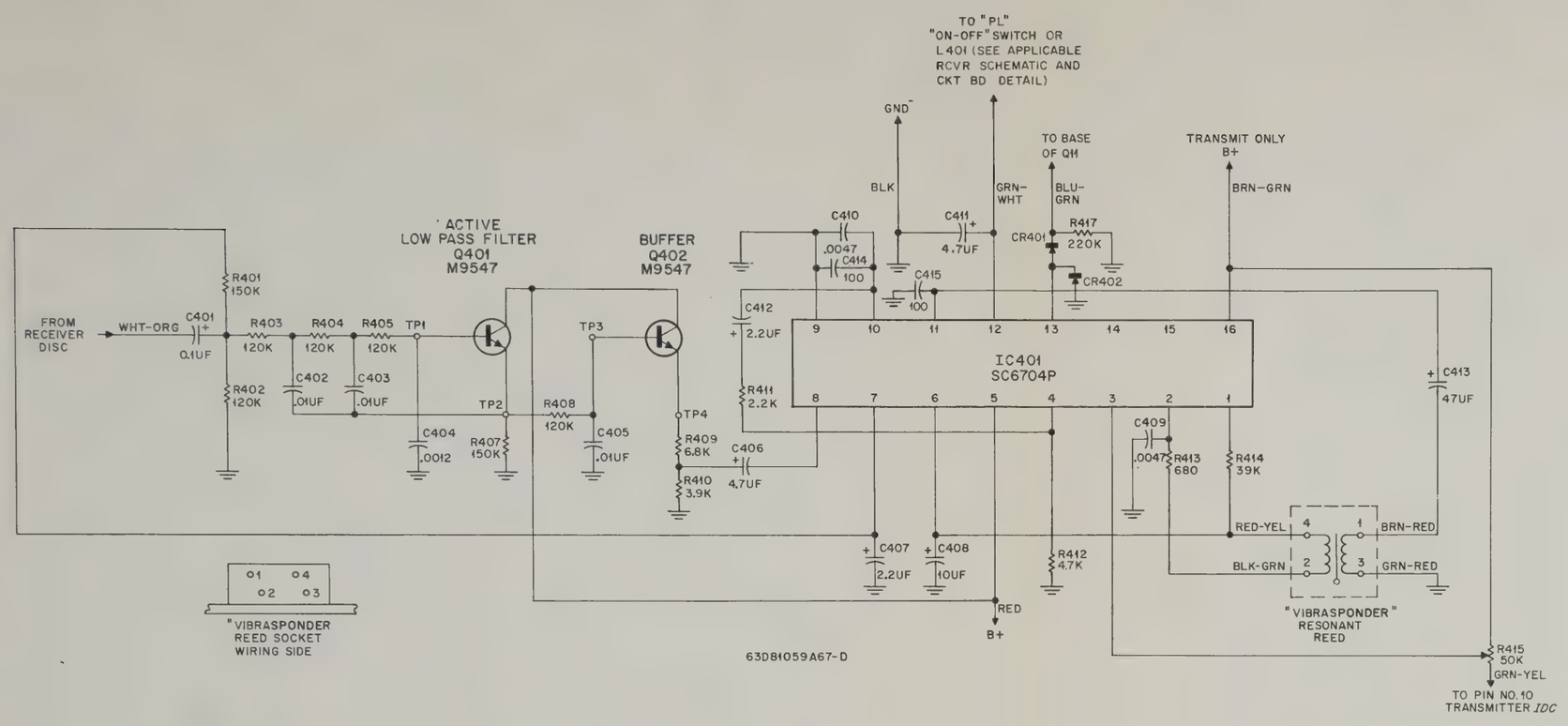
EPD-23352-O

FOR UNITS SUFFIXED -1 OR EARLIER, REFER TO PEPD-25282.

EPD-26041-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

NLN8031A "Private-Line" Deck
Schematic Diagram & Printed Circuit Board Detail
Motorola No. PEPD-26032-O
11/15/71-CP



TEST MEASUREMENTS

PROBE POINT	DC VOLTAGES *DECODE MODE	DC VOLTAGES ENCODE+ MODE	AC VOLTAGES *DECODE MODE	AC VOLTAGES ENCODE+ MODE
TP1	3.15 V	3.15 V	17.00 mV (-33.2 dBm)	0.00 V
TP2	2.72 V	2.72 V	17.00 mV (-33.2 dBm)	0.00 V
TP3	2.58 V	2.58 V	12.50 mV (-36.0 dBm)	0.00 V
TP4	1.98 V	1.98 V	12.50 mV (-36.0 dBm)	0.00 V
IC PIN 1	6.30 V	6.30 V	-	-
IC PIN 2	5.40 V	2.80 V	0.68 V (-1.0 dBm)	0.15 V (-14.2 dBm)
IC PIN 3	0.25 V	11.00 V	-	-
IC PIN 4	1.45 V	1.65 V	75.00 mV (-20.2 dBm)	0.40 V (-5.8 dBm)
IC PIN 5	15.00 V	15.00 V	-	-
IC PIN 6	6.40 V	2.90 V	20.00 mV (-31.8 dBm)	-
IC PIN 7	7.10 V	7.00 V	-	-
IC PIN 8	0.74 V	0.30 V	2.07 mV (-51.5 dBm)	-
IC PIN 9	-	-	-	-
IC PIN 10	1.38 V	1.40 V	65.00 mV (-21.5 dBm)	0.34 V (-7.2 dBm)
IC PIN 11	0.82 V	0.80 V	67.00 mV (-21.2 dBm)	20.00 mV (-31.8 dBm)
IC PIN 12	0.05 V	0.98 V	24.00 mV (-30.2 dBm)	-
IC PIN 13	0.10 V	1.20 V	3.50 mV (-46.9 dBm)	-
IC PIN 14	0.50 V	0.75 V	5.50 mV (-42.9 dBm)	-
IC PIN 15	0.50 V	0.75 V	34.00 mV (-27.0 dBm)	-
IC PIN 16	0.08 V	15.00 V		-

*VOLTAGES MEASURED WITH 14.0 mV (-35 dBm) OF "PL" TONE AT INPUT (METER POINT M4) USING MODULATED SIGNAL GENERATOR.
**VOLTAGE WITHIN 0.0V TO 0.7 V RANGE DEPENDING UPON SETTING OF R415.
+VOLTAGES MEASURED WITH TRANSMITTER OSCILLATOR INOPERATIVE (GROUND THE TRANSMITTER CONTROL CRYSTAL(S).

EPD-23909-B

SEE TRANSMITTER DIAGRAM FOR MODEL AND SUFFIX INFORMATION.

EPD-23352-O

FOR UNITS SUFFIXED -1 OR EARLIER, REFER TO PEPD-25282.

EPD-26041-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

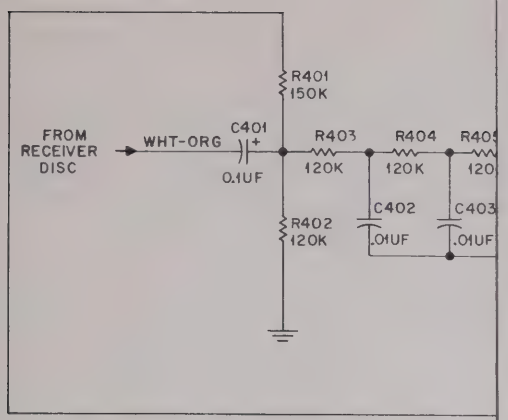
NLN8031A "Private-Line" Deck
Schematic Diagram & Printed Circuit Board Detail
Motorola No. PEPD-26032-O
11/15/71-CP

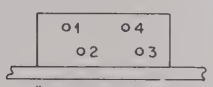
TEST MEASUREMENTS

PROBE POINT	DC VOLTAGES		AC VOLTAGES	
	*DECODE MODE	ENCODE+ MODE	*DECODE MODE	ENCODE+ MODE
TP1	3.15 V	3.15 V	17.00 MV (-33.2 dbm)	0.00 V
TP2	2.72 V	2.72 V	17.00 MV (-33.2 dbm)	0.00 V
TP3	2.58 V	2.58 V	12.50 MV (-10.2 dbm)	0.00 V
TP4	1.98 V	1.98 V	12.50 MV (-10.2 dbm)	0.00 V
IC PIN 1	6.30 V	6.30 V	-	-
IC PIN 2	5.40 V	2.80 V	0.68 V (-0.2 dbm)	0.15 V (-14.2 dbm)
IC PIN 3	0.05 V	10.00 V	8.80 MV (-38.8 dbm)	**
IC PIN 4	1.45 V	1.65 V	75.00 MV (-20.2 dbm)	0.40 V (-5.8 dbm)
IC PIN 5	15.00 V	15.00 V	-	-
IC PIN 6	6.40 V	2.90 V	-	-
IC PIN 7	7.10 V	7.00 V	-	-
IC PIN 8	0.74 V	0.30 V	2.07 MV (-51.5 dbm)	-
IC PIN 9	-	-	-	-
IC PIN 10	1.38 V	1.40 V	65.00 MV (-21.5 dbm)	0.34 V (-7.2 dbm)
IC PIN 11	0.82 V	0.80 V	67.00 MV (-21.2 dbm)	20.00 MV (-31.8 dbm)
IC PIN 12	0.05 V	0.98 V	-	-
IC PIN 13	0.10 V	1.20 V	-	-
IC PIN 14	0.50 V	0.75 V	-	-
IC PIN 15	0.50 V	0.75 V	-	-
IC PIN 16	0.08 V	15.00 V	-	-

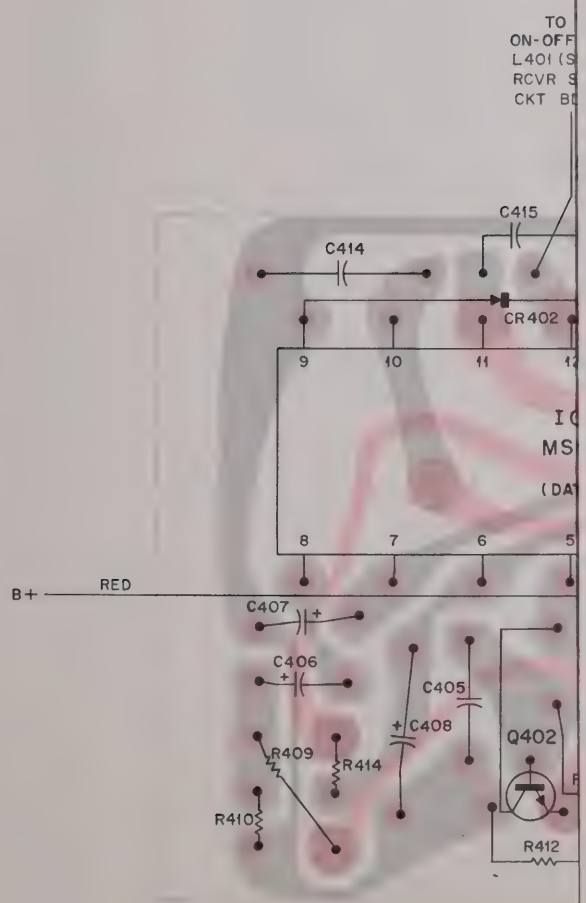
*VOLTAGES MEASURED WITH 14.0 MV (-35 DBM) OF "PL" TONE AT INPUT (METER POINT M4) USING MODULATED SIGNAL GENERATOR.
**DEPENDENT UPON SETTING OF R415; (-13.2 DBM, -2.5 DBM) (0.17 V - 0.58 V).
+VOLTAGES MEASURED WITH TRANSMITTER OSCILLATOR INOPERATIVE (SHUNT EMITTER OF Q101 TO GROUND WITH .01 UF CAPACITOR).

EPD-22808-B





"VIBRASPONDER REED SOCKET WIRING SIDE



SEE TRANSMITTER DIAGRAM FOR MODEL AND SUFFIX INFORMATION

EPD-23352-O

FOR UNITS SUFFIXED -2 OR LATER, REFER TO PEPD-26032.

EPD-26040-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

"Private-Line" Féature
Schematic Diagram & Printed Circuit Board Detail
Motorola No. PEPD-25282-A
11/15/71-CP

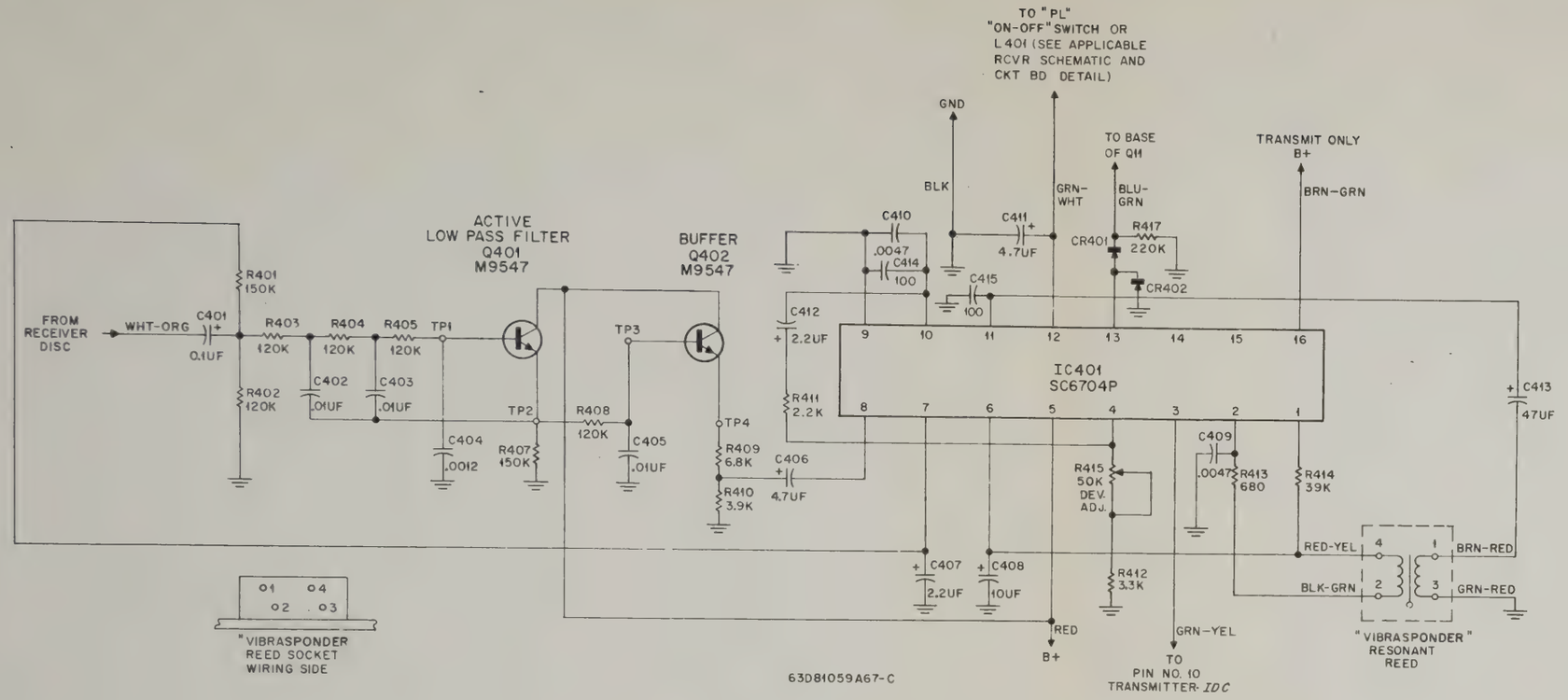
PARTS LIST

NLN8031A "Private-Line" Deck EPD-25166-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF unless stated
C401	23D83397D05	0.1 ±20%; 6 V
C402, 403, 405	21D84008H01	0.01 ±10%; 50 V
C404	21D82213E14	.0012 ±5%; 100 V
C406, 411	23D83441B18	4.7 ±20%; 20 V
C407, 412	23D83441B12	2.2 ±20%; 15 V
C408	23D83441B19	10 ±20%; 20 V
C409, 410	21D82213E07	.0047 ±10%; 100 V
C413	23D83441B13	47 ±20%; 6 V
C414, 415	21K861436	100 pF ±10%; N750 75 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR401	48C83654H01	silicon
CR402	48C82363E03	silicon
		INTEGRATED CIRCUIT
IC401	51R84267A04	SC6704P
		TRANSISTOR: (SEE NOTE)
Q401, 402	48R869547	N-P-N; type M9547
		RESISTOR, fixed: Ω ±10%; 1/8 W unless stated
R401, 407	6S185C06	150k
R402	6S185C05	120k
R403, 404, 405, 408	6S185A99	120k ±5%
R409	6S185B89	6.8k
R410	6S185B86	3.9k
R411	6S185B83	2.2k
R412	6S185B87	4.7k
R413	6S185B77	680
R414	6S185B98	39
R415	18C82876B07	var; 50k
R417	6S185C08	220k
NON-REFERENCED ITEMS		
	7A83783H01	BRACKET, reed mtg.
	14C83786H01	BASE, socket
	15B83785H01	COVER, socket
	14A83782H01	INSULATOR, board

NOTE:

For optimum performance order replacement diodes and transistors by Motorola part number only.



OL-DEPD-22469-D

TEST MEASUREMENTS

PROBE POINT	DC VOLTAGES		AC VOLTAGES	
	*DECODE MODE	ENCODE+ MODE	*DECODE MODE	ENCODE+ MODE
TP1	3.15 V	3.15 V	17.00 MV (-33.2 dbm)	0.00 V
TP2	2.72 V	2.72 V	17.00 MV (-33.2 dbm)	0.00 V
TP3	2.58 V	2.58 V	12.50 MV (-10.2 dbm)	0.00 V
TP4	1.98 V	1.98 V	12.50 MV (-10.2 dbm)	0.00 V
IC PIN 1	6.30 V	6.30 V	-	-
IC PIN 2	5.40 V	2.80 V	0.68 V (-0.2 dbm)	0.15 V (-14.2 dbm)
IC PIN 3	0.05 V	10.00 V	8.80 MV (-38.8 dbm)	**
IC PIN 4	1.45 V	1.65 V	75.00 MV (-20.2 dbm)	0.40 V (-5.8 dbm)
IC PIN 5	15.00 V	15.00 V	-	-
IC PIN 6	6.40 V	2.90 V	-	-
IC PIN 7	7.10 V	7.00 V	-	-
IC PIN 8	0.74 V	0.30 V	2.07 MV (-51.5 dbm)	-
IC PIN 9	-	-	-	-
IC PIN 10	1.38 V	1.40 V	65.00 MV (-21.5 dbm)	0.34 V (-7.2 dbm)
IC PIN 11	0.82 V	0.80 V	67.00 MV (-21.2 dbm)	20.00 MV (-31.8 dbm)
IC PIN 12	0.05 V	0.98 V	-	-
IC PIN 13	0.10 V	1.20 V	-	-
IC PIN 14	0.50 V	0.75 V	-	-
IC PIN 15	0.50 V	0.75 V	-	-
IC PIN 16	0.08 V	15.00 V	-	-

*VOLTAGES MEASURED WITH 14.0 MV (-35 DBM) OF "PL" TONE AT INPUT (METER POINT M4) USING MODULATED SIGNAL GENERATOR.
**DEPENDENT UPON SETTING OF R415; (-13.2 DBM, -2.5 DBM) (0.17 V - 0.58 V).
+VOLTAGES MEASURED WITH TRANSMITTER OSCILLATOR INOPERATIVE (SHUNT EMITTER OF Q101 TO GROUND WITH .01 UF CAPACITOR).

EPD-22808-B

SEE TRANSMITTER DIAGRAM FOR MODEL AND SUFFIX INFORMATION

EPD-23352-O

FOR UNITS SUFFIXED -2 OR LATER, REFER TO PEPD-26032.

EPD-26040-O

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

"Private-Line" Feature
Schematic Diagram & Printed Circuit Board Detail
Motorola No. PEPD-25282-A
11/15/71-CP

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2	R104A	ADDED 56k	ACROSS R104
	NUD6003AH-2	R108A	ADDED 1k	ACROSS R108
	NUD6004AH-2	R112A	ADDED 100k	ACROSS R112
B	NUD6002AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
	NUD6003AH-3	R108	WAS 6S185B68, 120	Q103 EMITTER
	NUD6004AH-3	R112	WAS 6S185B95, 22k	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NUD6002AH-4	C160	REMOVED 21K864012, 60 pF	ACROSS C110
	NUD6102AH-1	C161	REMOVED 21K861431	ACROSS C124

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
01	NLN8031A	L401	COIL MOVED FROM "PRIVATE-LINE" SCHEMATIC / PRINTED CKT BD DET TO RCVR SCHEMATICS & XMTR-RCVR PRINTED CKT BD DETAILS	PIN 12, IC101
A	NLN8031A-1	CR402	ADDED	PIN 13 TO PIN 9 OF IC401

PARTS LIST

NLN8031A "Private-Line" Deck EPD-25166-A

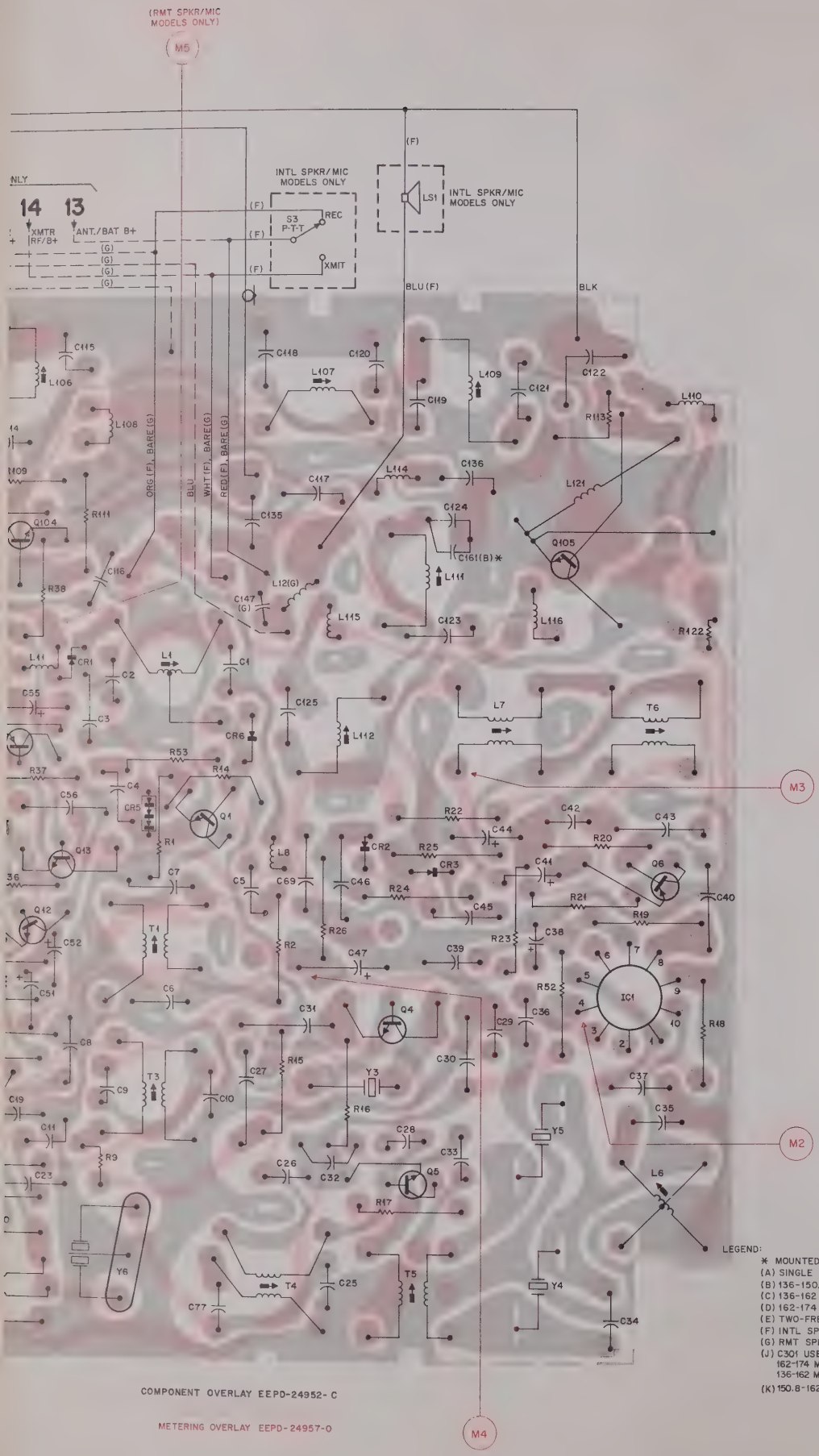
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uF unless stated
C401	23D83397D05	0.1 ±20%; 6 V
C402, 403, 405	21D84008H01	0.01 ±10%; 50 V
C404	21D82213E14	.0012 ±5%; 100 V
C406, 411	23D82397D05	4.7 +40-20%; 100 V
C407, 412	23D82397D19	2.2 +40-20%; 10 V
C408	23D82397D15	10 ±20%; 20 V
C409, 410	21D82213E07	.0047 ±10%; 100 V
C413	23D82397D21	47 ±20%; 6 V
C414, 415	21K861436	100 pF ±10%; N750 75 V
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR401	48C83654H01	silicon
CR402	48C82363E03	silicon
		INTEGRATED CIRCUIT
IC401	51R84267A04	SC6704P
		TRANSISTOR: (SEE NOTE)
Q401, 402	48R869547	N-P-N; type M9547
		RESISTOR, fixed: Ω ±10%; 1/8 W unless stated
R401, 407	6S185C06	150k
R402	6S185C05	120k
R403, 404, 405, 408	6S185A99	120k ±5%
R409	6S185B89	6.8k
R410	6S185B86	3.9k
R411	6S185B83	2.2k
R412	6S185B85	3.3k
R413	6S185B77	680
R414	6S185B98	39
R415	18C82876B07	var; 50k
R417	6S185C08	220k
NON-REFERENCED ITEMS		
	7A83783H01	BRACKET, reed mtg.
	14C83786H01	BASE, socket
	15B83785H01	COVER, socket
	14A83782H01	INSULATOR, board

NOTE:

For optimum performance order replacement diodes and transistors by Motorola part number only.

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2	R104A	ADDED 56k	ACROSS R104
	NUD6003AH-2	R108A	ADDED 1k	ACROSS R108
	NUD6004AH-2	R112A	ADDED 100k	ACROSS R112
B	NUD6002AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
	NUD6003AH-3	R108	WAS 6S185B68, 120	Q103 EMITTER
	NUD6004AH-3	R112	WAS 6S185B95, 22k	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NUD6002AH-4	C160	REMOVED 21K864012, 60 pF	ACROSS C110
	NUD6102AH-1	C161	REMOVED 21K861431	ACROSS C124



LEGEND:

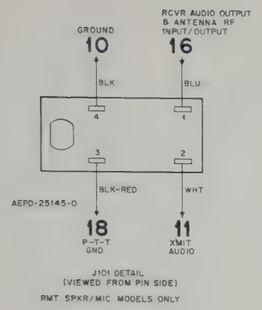
* MOUNTED ON SOLDER SIDE.
(A) SINGLE FREQ MODELS ONLY.
(B) 136-150.8 MHz MODELS ONLY.
(C) 136-162 MHz MODELS ONLY.
(D) 162-174 MHz MODELS ONLY.
(E) TWO-FREQ MODELS ONLY.
(F) INTL SPKR/MIC MODELS ONLY.
(G) RMT SPKR/MIC MODELS ONLY.
(J) C301 USED ONLY IN 1&2 FREQ 162-174 MHz MODELS AND 3,4,5,&6 FREQ 136-162 MHz MODELS
(K) 150.8-162 MHz MODELS ONLY.

COMPONENT OVERLAY EEPD-24952-C

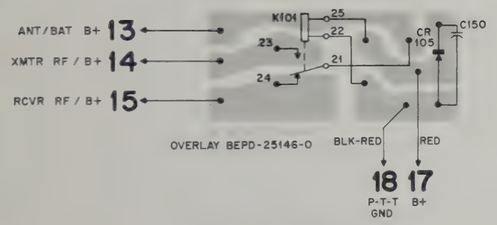
METERING OVERLAY EEPD-24957-0

REVISIONS

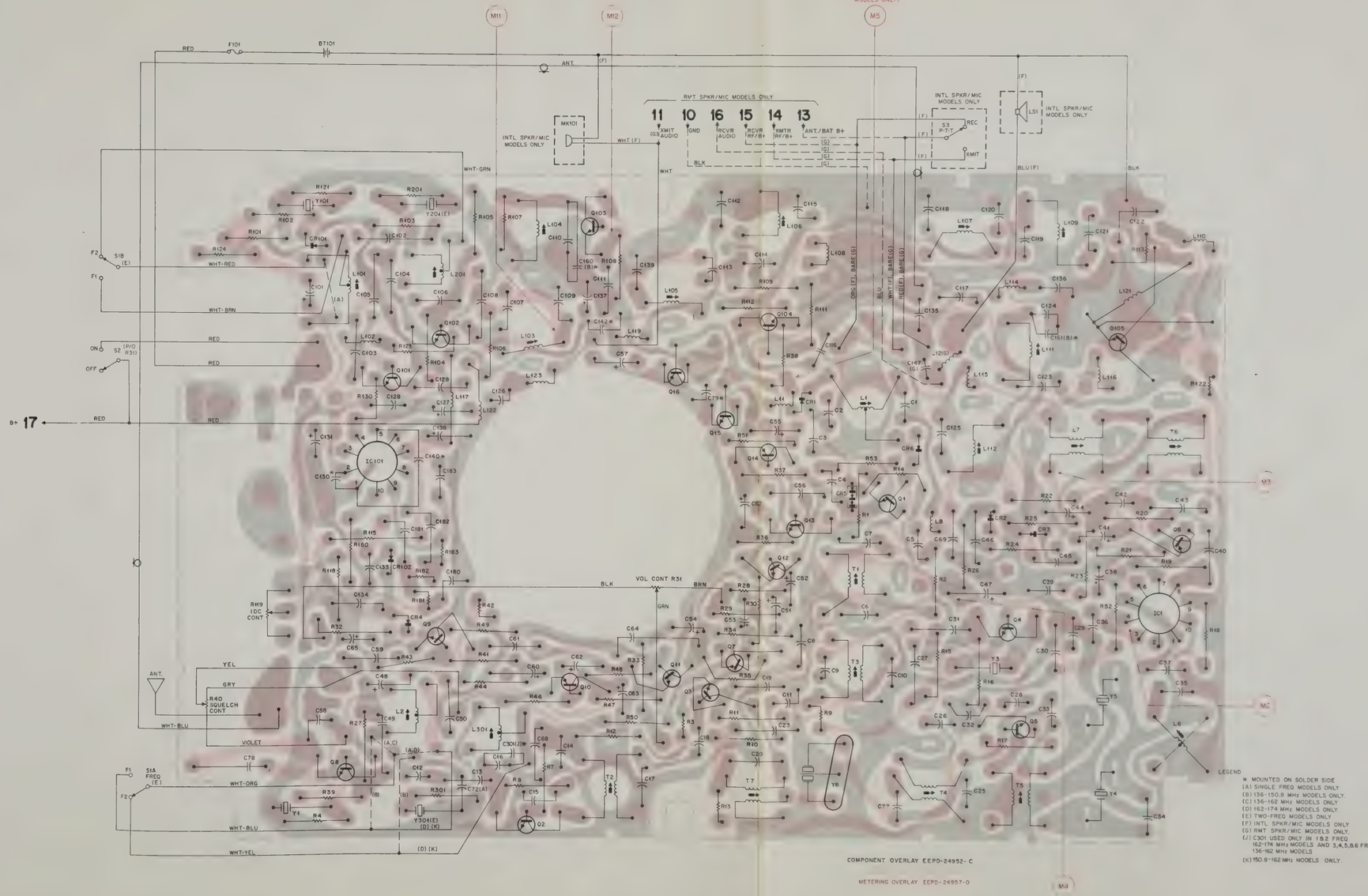
DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2 NUD6003AH-2 NUD6004AH-2	R104A	ADDED 56k	ACROSS R104
		R108A	ADDED 1k	ACROSS R108
		R112	ADDED 100k	ACROSS R112
B	NUD6002AH-3 NUD6003AH-3 NUD6004AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
		R108	WAS 6S185B68, 120	Q103 EMITTER
		R112	WAS 6S185B95, 22k	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NLN8051A NLN8064A NLN8068A NLN8072A NLN8076A	L401	REMOVED 24D82549D03, 1.2 uH	LOWER LEFT OF CKT BD
D	NUD6002AH-4 NUD6102AH-1	C160	REMOVED 21K864012, 60 pF	WAS ACROSS C110
		C161	REMOVED 21K861431, 12 pF	WAS ACROSS C124



J101 DETAIL
(VIEWED FROM PIN SIDE)
RMT SPKR/MIC MODELS ONLY



RELAY BOARD DETAIL
RMT SPKR/MIC MODELS ONLY

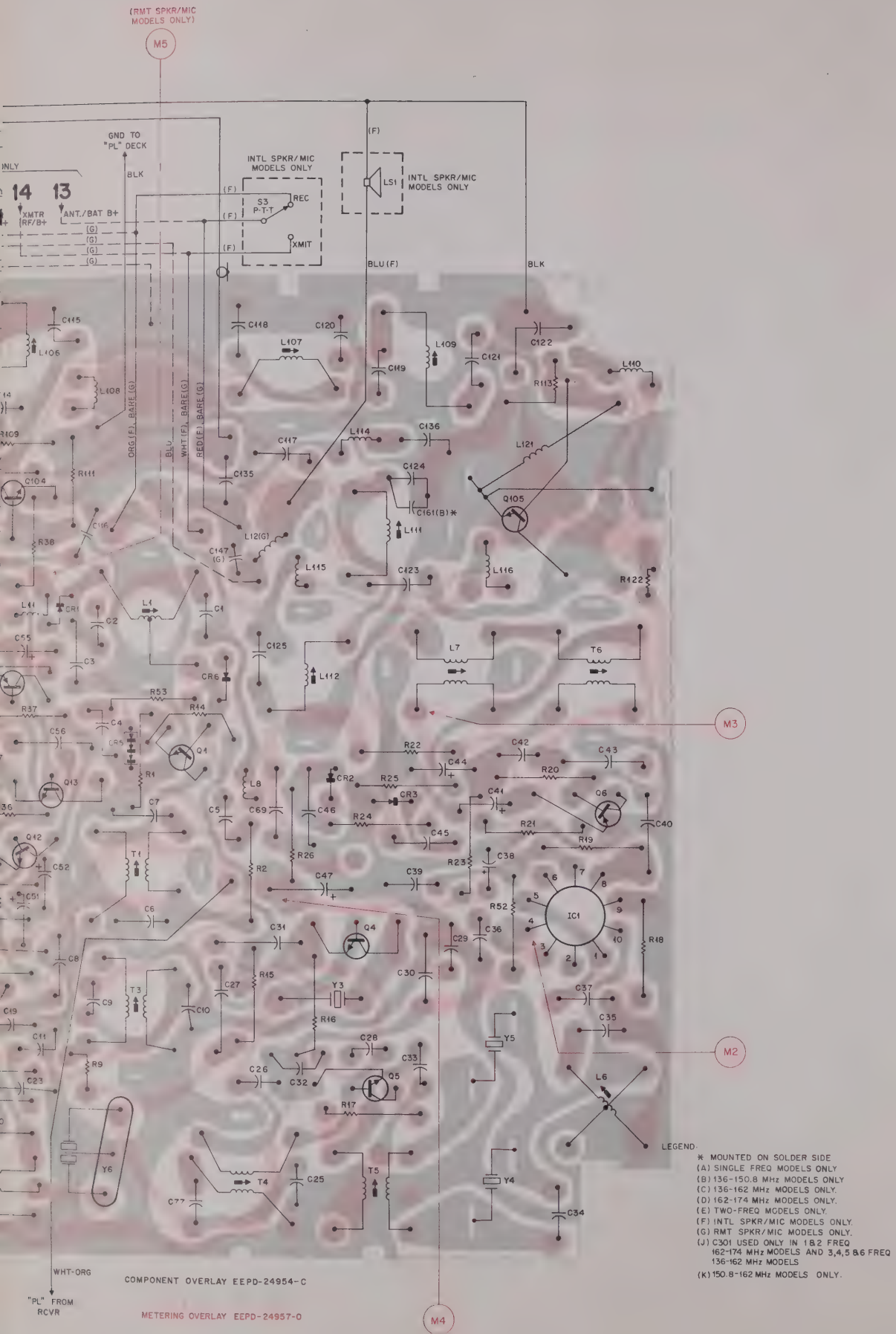


PREVIOUS REVISIONS SHOWN
ON BACK OF THIS DIAGRAM

Transmitter-Receiver
Printed Circuit Board Detail
CARRIER SQUELCH
INTERNAL & REMOTE SPKR/MIC
1 AND 2 FREQUENCY
Motorola No. PEPD-24945-C
11/15/71-CP

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2	R104A	ADDED 56k	ACROSS R104
	NUD6003AH-2	R108A	ADDED 1k	ACROSS R108
	NUD6004AH-2	R112	ADDED 100k	ACROSS R112
B	NUD6002AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
	NUD6003AH-3	R108	WAS 6S185B68, 120	Q103 EMITTER
	NUD6004AH-3	R112	WAS 6S185B95, 22k	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NLN8051A	L401	REMOVED 24D82549D03, 1.2 uH	LOWER LEFT OF CKT BD
	NLN8064A			
	NLN8068A			
	NLN8072A			
	NLN8076A			
D	NUD6002AH-4	C160	REMOVED 21K864012, 60 pF	WAS ACROSS C110
	NUD6102AH-1	C161	REMOVED 21K861431, 12 pF	WAS ACROSS C124



COMPONENT OVERLAY EEPD-24954-C

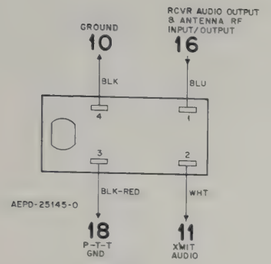
METERING OVERLAY EEPD-24957-0

LEGEND

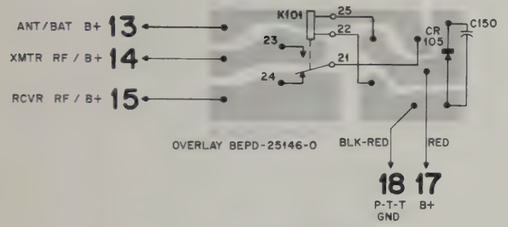
* MOUNTED ON SOLDER SIDE
(A) SINGLE FREQ MODELS ONLY
(B) 136-150.8 MHz MODELS ONLY
(C) 136-162 MHz MODELS ONLY.
(D) 162-174 MHz MODELS ONLY.
(E) TWO-FREQ MODELS ONLY.
(F) INTL SPKR/MIC MODELS ONLY.
(G) RMT SPKR/MIC MODELS ONLY.
(J) C301 USED ONLY IN 1 & 2 FREQ 162-174 MHz MODELS AND 3,4,5 & 6 FREQ 136-162 MHz MODELS
(K) 150.8-162 MHz MODELS ONLY.

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2 NUD6003AH-2 NUD6004AH-2	R104A	ADDED 56k	ACROSS R104
		R108A	ADDED 1k	ACROSS R108
		R112A	ADDED 100k	ACROSS R112
B	NUD6002AH-3 NUD6003AH-3 NUD6004AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
		R108	WAS 6S185B68, 120	Q103 EMITTER
		R112	WAS 6S185B95	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NLN8051A NLN8064A NLN8068A NLN8072A NLN8076A	L401	REMOVED 24D82549D03, 1.2 uH	LOWER LEFT OF CKT. BD.
D	NUD6002AH-4 NUD6102AH-1	C160	REMOVED 21K864012, 60 pF	WAS ACROSS C110
		C161	REMOVED 21K861431, 12 pF	WAS ACROSS C124



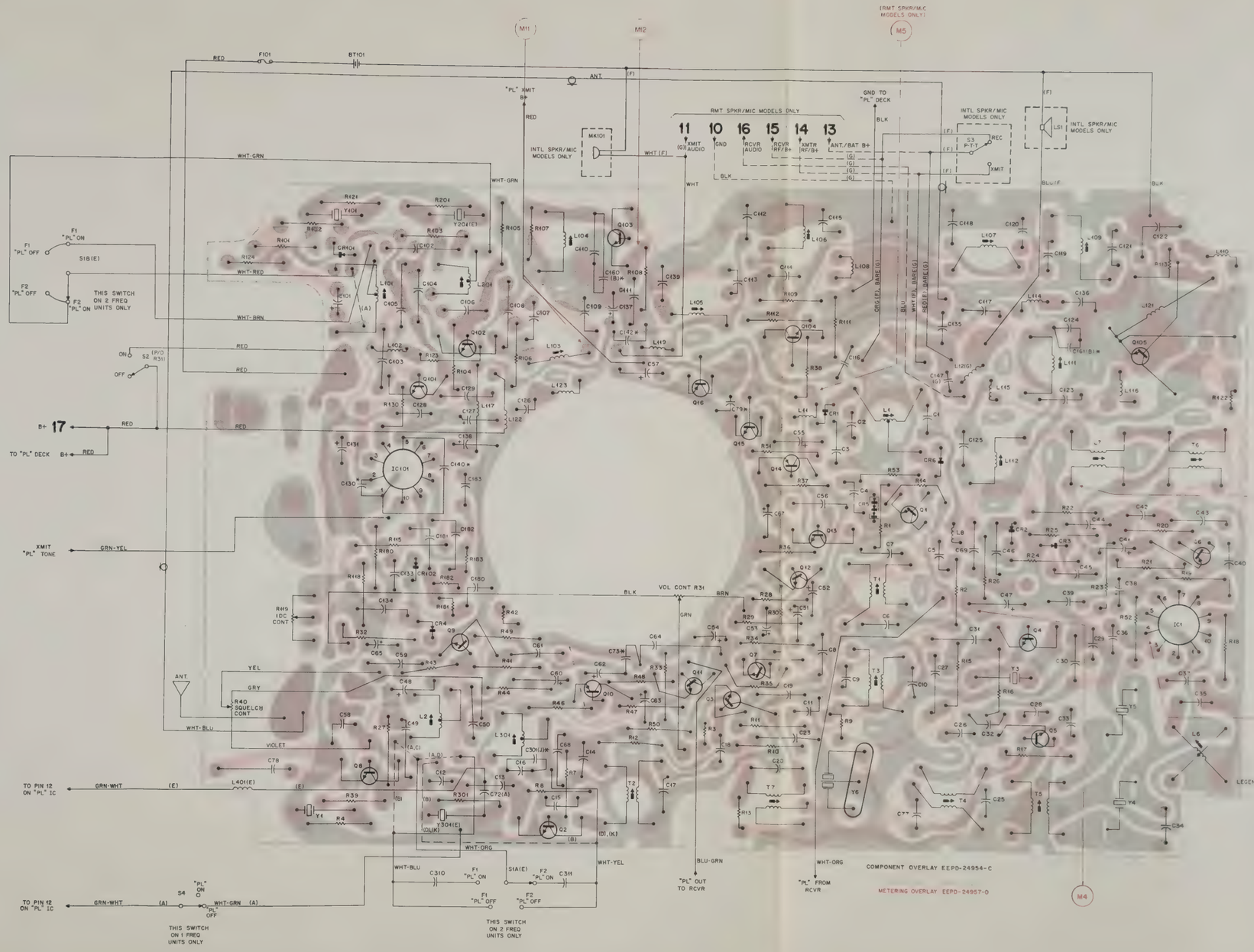
J101 DETAIL
(VIEWED FROM PIN SIDE)
RMT SPKR/MIC MODELS ONLY



RELAY BOARD DETAIL
RMT SPKR/MIC MODELS ONLY

PREVIOUS REVISIONS SHOWN
ON BACK OF THIS DIAGRAM

Transmitter-Receiver
Printed Circuit Board Detail
"PRIVATE-LINE" SQUELCH
INTERNAL & REMOTE SPKR/MIC
1 AND 2 FREQUENCY
Motorola No. PEPD-24947-D
11/15/71-CP



REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2	R104A	ADDED 56k	ACROSS R104
	NUD6003AH-2	R108A	ADDED 1k	ACROSS R108
	NUD6004AH-2	R112A	ADDED 100k	ACROSS R112
B	NUD6002AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
	NUD6003AH-3	R108	WAS 6S185B68, 120	Q103 EMITTER
	NUD6004AH-3	R112	WAS 6S185B95	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NLN8051A	L401	REMOVED 24D82549D03, 1.2 uH	LOWER LEFT OF CKT. BD.
	NLN8064A			
	NLN8068A			
	NLN8072A			
	NLN8076A			
D	NUD6002AH-4	C160	REMOVED 21K864012, 60 pF	WAS ACROSS C110
	NUD6102AH-1	C161	REMOVED 21K861431, 12 pF	WAS ACROSS C124

LEGEND:

* MOUNTED ON SOLDER SIDE.

** INDICATES PARTS USED FOR FACTORY TESTING ONLY.

(B) 136–150.8 MHz MODELS ONLY.

(F) INTL SPKR/MIC MODELS ONLY.

(G) RMT SPKR/MIC MODELS ONLY.

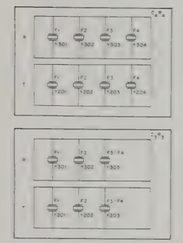
(H) "PL" MODELS ONLY.

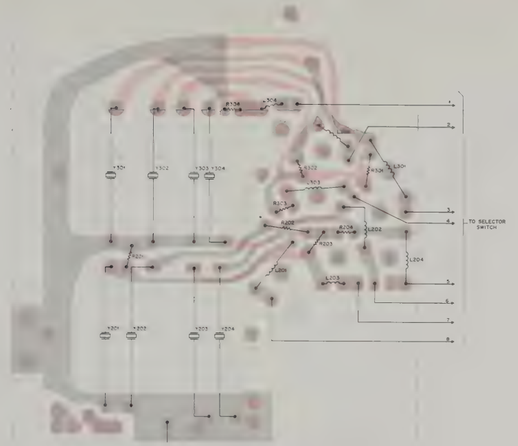
(L) IN 3 TO 6 FREQ RADIOS, C301 USED IN 136–162 MHz MODELS ONLY.

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2	R104A	ADDED 56k	ACROSS R104
	NUD6003AH-2	R108A	ADDED 1k	ACROSS R108
	NUD6004AH-2	R112A	ADDED 100k	ACROSS R112
B	NUD6002AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
	NUD6003AH-3	R108	WAS 6S185B68, 120	Q103 EMITTER
	NUD6004AH-3	R112	WAS 6S185B95	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NLN8051A	L401	REMOVED 24D82549D03, 1.2 uH	LOWER LEFT OF CKT. BD.
	NLN8064A			
	NLN8068A			
	NLN8072A			
	NLN8076A			
D	NUD6002AH-4	C160	REMOVED 21K864012, 60 pF	WAS ACROSS C110
	NUD6102AH-1	C161	REMOVED 21K861431, 12 pF	WAS ACROSS C124

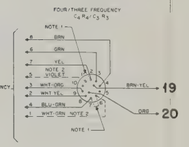
CRYSTAL LOCATION DETAILS





TO SELECTOR SWITCH

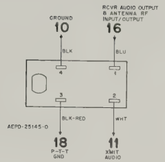
SELECTOR SWITCH

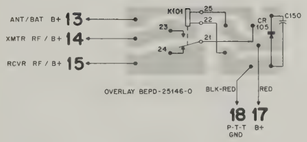


EEPD-23631-B1

MULTI-FREQ 80 & FREQ SEL SW SHOWN FOR 3 OR 4 FREQ MODELS (FOR 5 OR 6 FREQ MODELS, SEE SEPARATE DIAGRAM) NOTE 3

PREVIOUS REVISIONS SHOWN
ON BACK OF THIS DIAGRAM
Transmitter-Receiver
Printed Circuit Board Detail
CARRIER & PRIVATE-LINE SQUELCH
INTERNAL & REMOTE SPKR/MIC
2 TO 6 FREQUENCY
Motorola No. PEPD-24946-D
11/15/71-CP





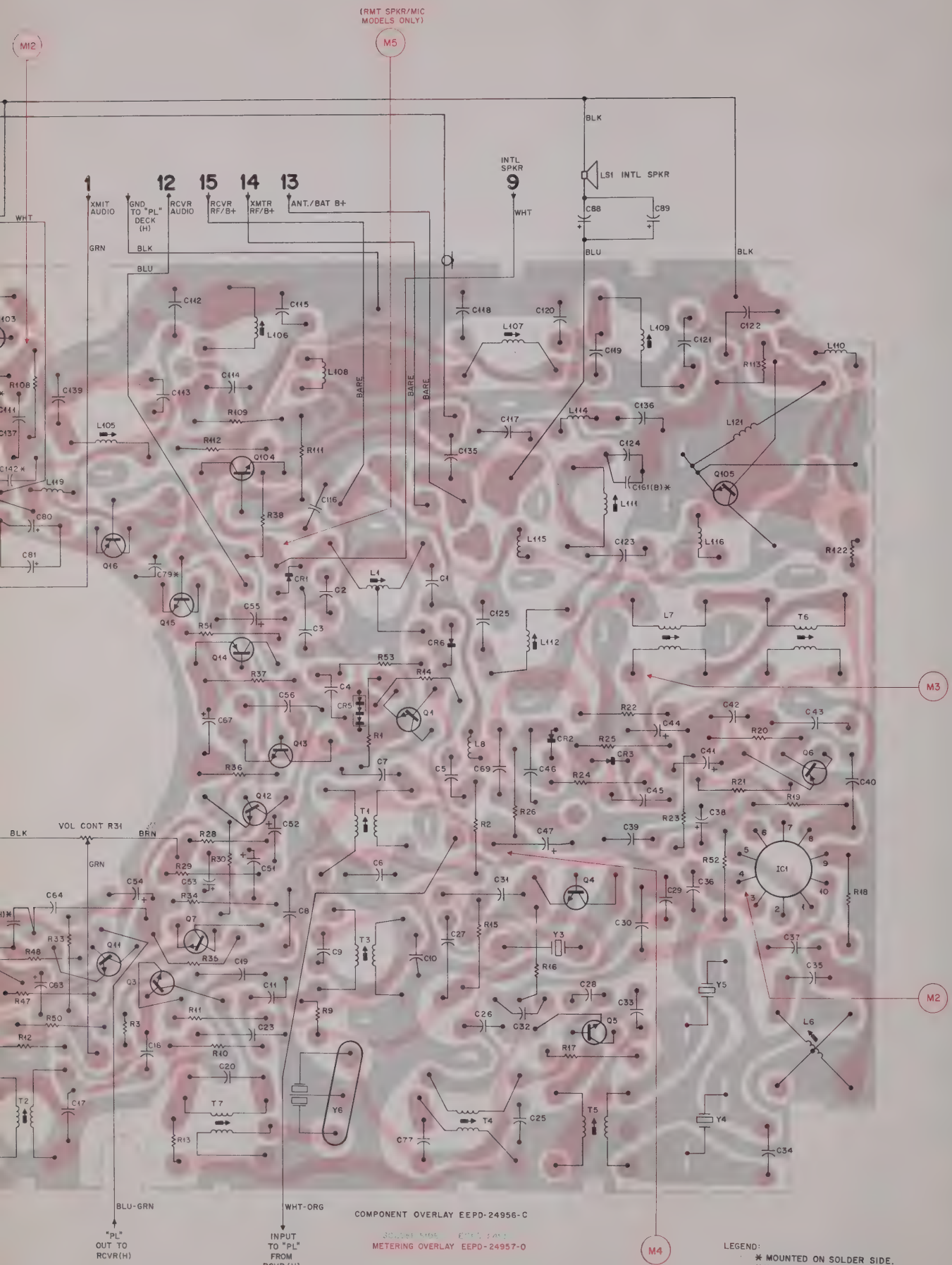
RELAY BOARD DETAIL
RMT SPKR/MIC MODELS ONLY

NOTES:
1. JUMPERS USED FOR THREE-FREQUENCY OPERATION ONLY.
2. VIOLET AND WHT-GRN WIRES USED FOR FOUR-FREQUENCY OPERATION ONLY.

EPD-23596-O

REVISIONS

DIAG. ISSUE	BOARD AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
A	NUD6002AH-2 NUD6003AH-2 NUD6004AH-2	R104A	ADDED 56k	ACROSS R104
		R108A	ADDED 1k	ACROSS R108
		R112A	ADDED 100k	ACROSS R112
B	NUD6002AH-3 NUD6003AH-3 NUD6004AH-3	R104	WAS 6S185C07, 180k	Q102 BASE
		R108	WAS 6S185B68, 120	Q103 EMITTER
		R112	WAS 6S185B95	ABOVE Q104
		R104A, 108A, 112A	REMOVED	
C	NLN8051A NLN8064A NLN8068A NLN8072A NLN8076A	L401	REMOVED 24D82549D03, 1.2 uH	LOWER LEFT OF CKT. BD.
D	NUD6002AH-4 NUD6102AH-1	C160	REMOVED 21K864012, 60 pF	WAS ACROSS C110
		C161	REMOVED 21K861431, 12 pF	WAS ACROSS C124



COMPONENT OVERLAY EEPD-24956-C

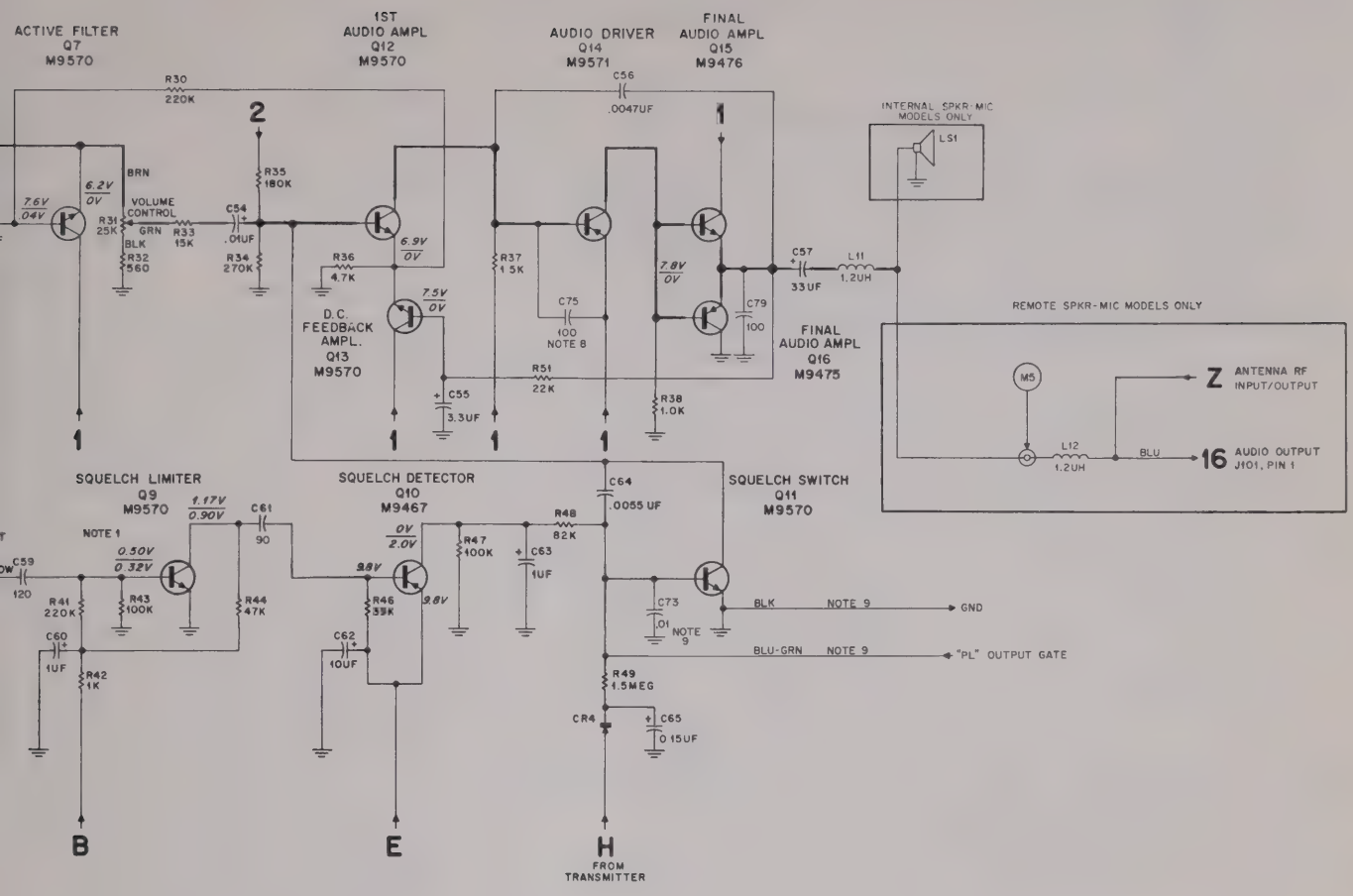
METERING OVERLAY EEPD-24957-0

LEGEND:

* MOUNTED ON SOLDER SIDE.
** INDICATES PARTS USED FOR FACTORY TESTING ONLY.

(B) 136-150.8 MHz MODELS ONLY.
(H) "PL" MODELS ONLY.
(J) C301 NOT USED IN 162-174 MHz MODELS.

BOARD



RECEIVER NOTES

RE TWO REFERENCE VOLTAGES ARE SHOWN, i.e. $\frac{10\ v}{12\ v}$,
TOM VALUE IS FOR SQUELCH MODE OF OPERATION, TOP
UE IS FOR UNSQUELCHED MODE.
ESS OTHERWISE STATED, CAPACITANCES ARE IN PICO-
ADS (UUF), AND RESISTANCES ARE IN OHMS (K = 1000 OHMS).
VOLTAGES ARE MEASURED USING A MOTOROLA DC MULTI-
ER, OR EQUIVALENT, AND ARE IN REFERENCE TO CHASSIS
UND (B-).
RATING FREQUENCIES:

- CARRIER FREQUENCY

HI IF FREQUENCY = 16.8 MHz

1ST OSCILLATOR FREQUENCY =
39.733-52.400 MHz (136-174 MHz)

$\frac{f_c - f_1}{3}$

2ND OSCILLATOR FREQUENCY (SEE TABLE 1)

LO IF FREQUENCY = 455 kHz

PER INCLUDED FOR THREE-FREQ OPERATION ONLY.
-GRN WIRE INCLUDED FOR FOUR-FREQ OPERATION ONLY.
AND VALUE OF CAPACITOR C301 DETERMINED AS FOLLOWS:

	136-150.8 MHz	150.8-162 MHz	162-174 MHz
EQ	CAPACITOR OMITTED	CAPACITOR OMITTED	4
EQ	CAPACITOR OMITTED	CAPACITOR OMITTED	4
, 6-FREQ	10	2.8	CAPACITOR OMITTED

ON H33FFN (5 WATT) SERIES ONLY.
ON "PRIVATE-LINE" MODELS ONLY.
PER INCLUDED FOR FIVE-FREQ OPERATION ONLY.
INCLUDED FOR SIX-FREQ OPERATION ONLY.
LABLE ON H23FFN (1.8 WATT) SERIES ONLY.
136-150.8 MHz
150.8-162 MHz
162-174 MHz

63E81067A86-B

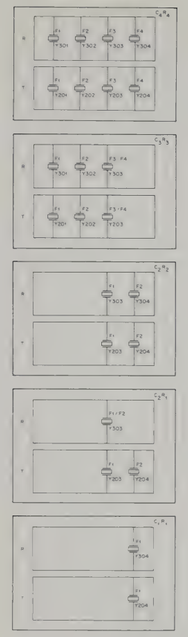
TABLE 1
2ND OSCILLATOR FREQUENCIES

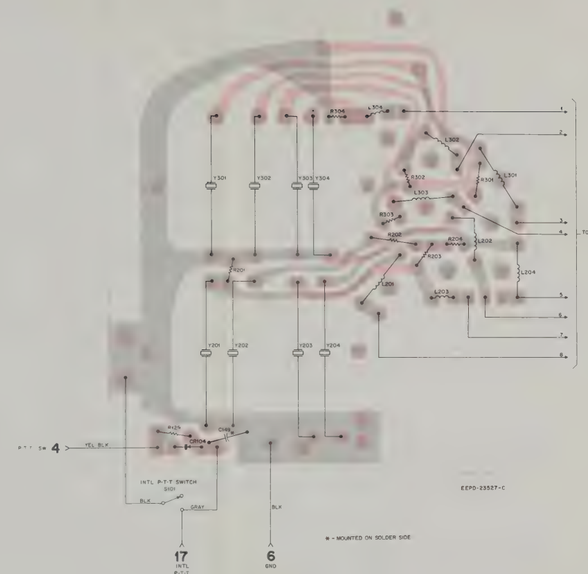
CARRIER FREQUENCY f_c (MHz)	2ND OSCILLATOR CRYSTAL FREQUENCY f_{02} (MHz)
136.000 — 138.500	16.345
138.501 — 142.000	17.255
142.001 — 147.000	16.345
147.001 — 150.800	17.255
150.801 — 162.000	16.345
162.001 — 170.000	17.255
170.001 — 174.000	16.345

PARTS LIST SHOWN ON
BACK OF THIS DIAGRAM

Receiver Portion
Carrier & "Private-Line" Squelch
Internal & Remote Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A86-B
11/15/71-CP

CRYSTAL LOCATION DETAILS



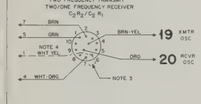


TO MULTI-FREQUENCY CIRCUIT BOARD

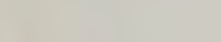
SELECTOR SWITCHES

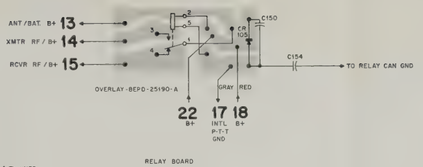
FOUR/THREE FREQUENCY C_4 R_4/C_3 R_3

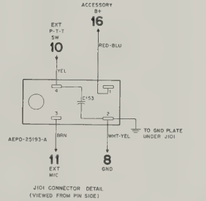
TWO FREQUENCY TRANSMIT TWO/ONE FREQUENCY RECEIVER C_2 R_2/C_3 R_3

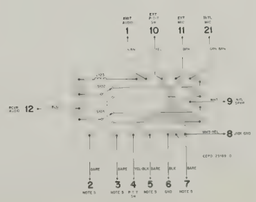


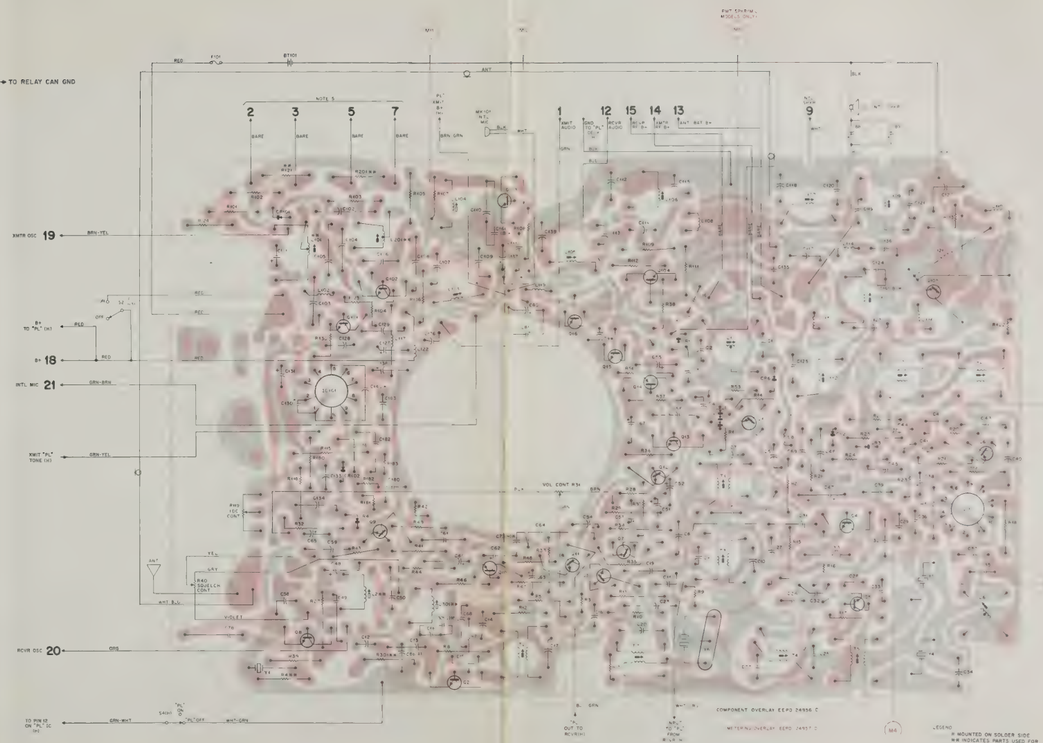
SINGLE FREQUENCY C_1 R_1











MULTI-FREQ BD & FREQ SEL SW DETAIL SHOWN FOR 1 TO 4 FREQ MODELS (FOR 5 OR 6 FREQ MODELS, SEE SEPARATE DIAGRAM)

PREVIOUS REVISIONS SHOWN ON BACK OF THIS DIAGRAM

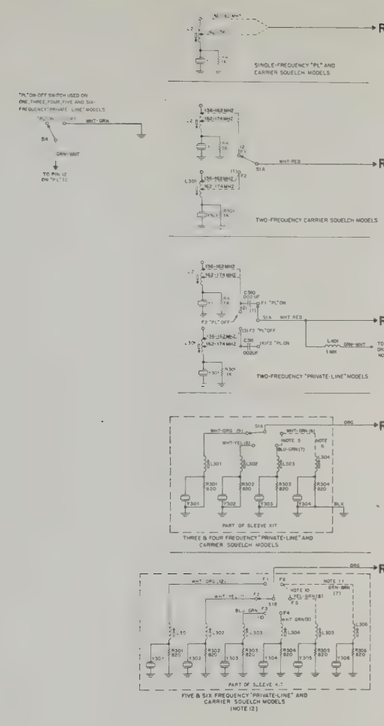
Transmitter-Receiver
Printed Circuit Board Detail
CARRIER & "PRIVATE-LINE" SQUELCH
UNIVERSAL SPKR/MIC
1 TO 6 FREQUENCY
Motorola No. PEPD-24949-D
11/15/71-CP

NOTES:
- JUMPERS USED FOR THREE-FREQUENCY OPERATION ONLY.
- VIOLET AND WHT-GRN WIRES USED FOR FOUR-FREQUENCY OPERATION ONLY.
- JUMPER USED FOR ONE-FREQUENCY OPERATION ONLY.
1 WHT-YEL WIRE USED FOR TWO-FREQUENCY OPERATION ONLY.
WIRES 2, 3, 5, 7 USED ONLY FOR MTG REED SW BD TO BASIC XMTR-RCVR BD.

EPD-25192-O

= MOUNTED ON SOLDER SIDE
N/A INDICATES PARTS USED FOR FACTORY TESTING ONLY

(B)-136-150.8 MHz MODELS ONLY
(H)"PL" MODELS ONLY
(J) C301 NOT USED IN 162-174 MHz MODELS


SINGLE-FREQUENCY "PL" AND CARRIER SQUELCH MODELS
"PL" ON-OFF SWITCH USED ON ONE, THREE, FOUR, FIVE AND SIX-FREQUENCY "PRIVATE-LINE" MODELS
TWO-FREQUENCY CARRIER SQUELCH MODELS
TWO-FREQUENCY "PRIVATE-LINE" MODELS
THREE & FOUR FREQUENCY "PRIVATE-LINE" AND CARRIER SQUELCH MODELS
FIVE & SIX FREQUENCY "PRIVATE-LINE" AND CARRIER SQUELCH MODELS (NOTE 12)

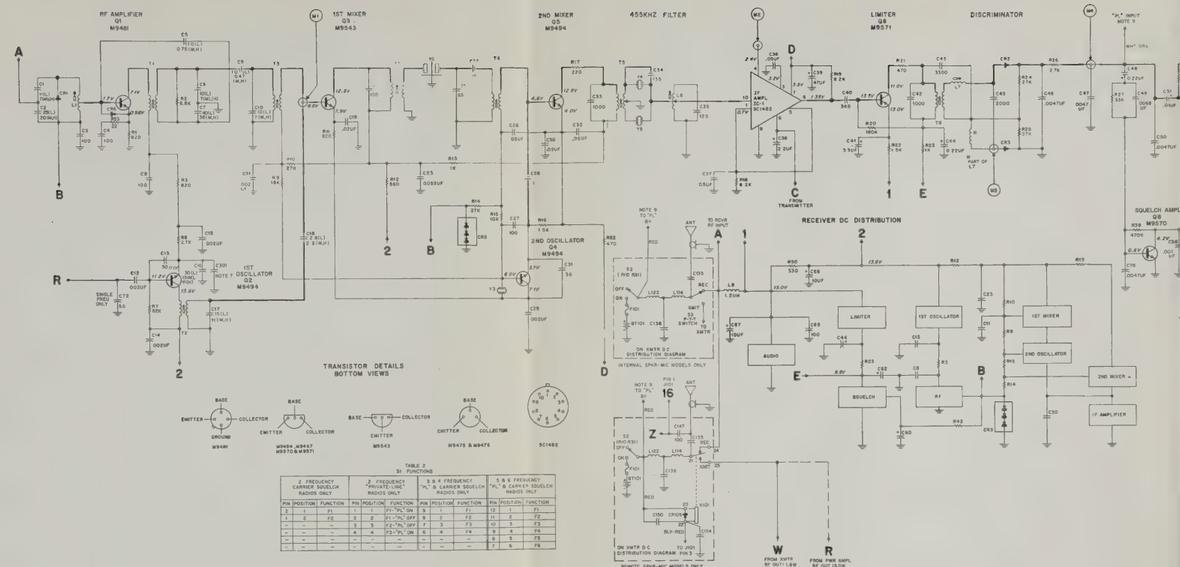


TABLE 2
SI FUNCTIONS

2 FREQUENCY CARRIER SQUELCH RADIOS ONLY			2 FREQUENCY "PRIVATE-LINE" RADIOS ONLY			3 & 4 FREQUENCY "PL" & CARRIER SQUELCH RADIOS ONLY			5 & 6 FREQUENCY "PL" & CARRIER SQUELCH RADIOS ONLY		
Pos	POSITION	FUNCTION	Pos	POSITION	FUNCTION	Pos	POSITION	FUNCTION	Pos	POSITION	FUNCTION
0	1	F1	0	1	F1-"PL" ON	9	1	F1	12	1	F1
1	2	F2	1	2	F1-"PL" OFF	8	2	F2	11	2	F2
"	"	"	2	3	F2-"PL" OFF	7	3	F3	10	3	F3
"	"	"	3	4	F2-"PL" ON	6	4	F4	9	4	F4
"	"	"	"	"	"	"	"	"	8	5	F5
"	"	"	"	"	"	"	"	"	7	6	F6

SEE TRANSMITTER DIAGRAM FOR MODEL AND SUFFIX INFORMATION

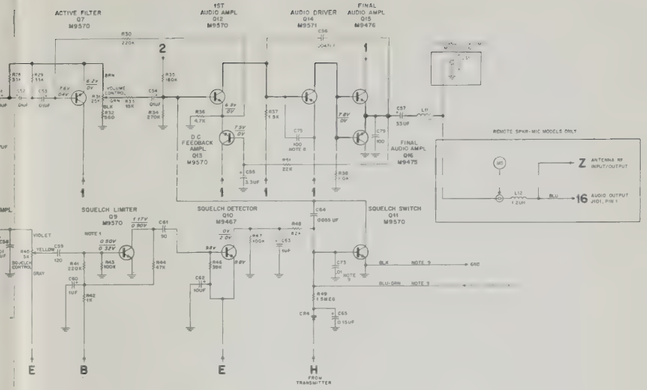
EPD-23352-O

REMOTE SPKR/MIC MODELS ONLY

IMPORTANT

THE ANTENNA RF INPUT/OUTPUT AND RCVR AUDIO OUTPUT ARE COMMON AT PIN 1 OF J101. IF DESIRED, THE REMOTE SPKR CAN BE DISCONNECTED AND SIMULATED BY CONNECTING A 40-OHM RESISTOR BETWEEN PIN 1 AND GROUND. HOWEVER, CARE MUST BE TAKEN TO INSERT A CHOKE (L 2 UH OR GREATER) BETWEEN PIN 1 AND THE RESISTOR OR THE RF CIRCUITS WILL BE LOADED AND ERRONEOUS MEASUREMENTS READ. ANY LONG WIRES TERMINATING ON PIN 1 BEFORE A CHOKE ARE ALSO RF LOADS.

EPD-25031-O


ACTIVE FILTER Q7 M9570
1ST AUDIO AMPL Q12 M9570
AUDIO DRIVER Q14 M9571
FINAL AUDIO AMPL Q15 M9470
DC FEEDBACK AMPL Q13 M9570
FINAL AUDIO AMPL Q16 M9470
REMOTE SPKR-MIC MODELS ONLY
ANTENNA RF INPUT/OUTPUT
AUDIO OUTPUT (NOT PIN 1
SQUELCH AMPL Q8 M9570
SQUELCH LIMITER Q9 M9570
SQUELCH DETECTOR Q10 M9467
SQUELCH SWITCH Q11 M9570
FROM TRANSMITTER

RECEIVER NOTES:

1. WHERE TWO REFERENCE VOLTAGES ARE SHOWN, i.e. $\frac{10\ V}{12\ V}$, BOTTOM VALUE IS FOR SQUELCH MODE OF OPERATION. TOP VALUE IS FOR UNSQUELCHED MODE.
2. UNLESS OTHERWISE STATED, CAPACITANCES ARE IN PICO-FARADS (PUF), AND RESISTANCES ARE IN OHMS (K = 1000 OHMS).
3. DC VOLTAGES ARE MEASURED USING A MOTOROLA DC MULTI-METER, OR EQUIVALENT, AND ARE IN REFERENCE TO CHASSIS GROUND (B-).
4. OPERATING FREQUENCIES:

   f_c = CARRIER FREQUENCY

   f_1 = HI IF FREQUENCY = 16.8 MHz

   f_{o1} = 1ST OSCILLATOR FREQUENCY = 39.733-52.600 MHz (136-174 MHz):

   $f_{o1} = \frac{f_c - f_1}{3}$

   f_{o2} = 2ND OSCILLATOR FREQUENCY (SEE TABLE 1)

   f_2 = LO IF FREQUENCY = 455 kHz

5. JUMPER INCLUDED FOR THREE-FREQ OPERATION ONLY.
6. WHT-GRN WIRE INCLUDED FOR FOUR-FREQ OPERATION ONLY.
7. USE AND VALUE OF CAPACITOR C301 DETERMINED AS FOLLOWS:

	(L) 136-150.8 MHz	(H) 150.8-162 MHz	(H) 162-174 MHz
1-FREQ	CAPACITOR OMITTED	CAPACITOR OMITTED	4
2-FREQ	CAPACITOR OMITTED	CAPACITOR OMITTED	4
3, 4, 5, 6-FREQ	10	2.8	CAPACITOR OMITTED

8. USED ON M33FFN (5 WATT) SERIES ONLY.
9. USED ON "PRIVATE-LINE" MODELS ONLY.
10. JUMPER INCLUDED FOR FIVE-FREQ OPERATION ONLY.
11. WIRE INCLUDED FOR SIX-FREQ OPERATION ONLY.
12. AVAILABLE ON H33FFN (1.8 WATT) SERIES ONLY.
13. (L) = 136-150.8 MHz
    (M) = 150.8-162 MHz
    (H) = 162-174 MHz

TABLE 1
2ND OSCILLATOR FREQUENCIES

CARRIER FREQUENCY (f_c) (MHz)	2ND OSCILLATOR CRYSTAL FREQUENCY (MHz)
136.000 — 138.800	16.345
138.801 — 143.000	17.055
143.001 — 147.000	16.345
147.001 — 150.800	17.055
150.801 — 162.200	16.345
162.201 — 170.000	17.055
170.001 — 174.000	16.345

EPD-24886-A

6SE81067A86-B

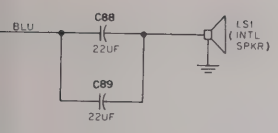
PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Receiver Portion
Carrier & "Private-Line" Squelch
Internal & Remote Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A86-B
11/15/71-CP

SEE TRANSMITTER DIAGRAM FOR MODEL AND SUFFIX INFORMATION

EPD-23352-O

TO REED SW S103 (SEE XMTR SCHEMATIC)



RECEIVER NOTES

1. WHERE TWO REFERENCE VOLTAGES ARE SHOWN, i.e. $\frac{10V}{12V}$, BOTTOM VALUE IS FOR SQUELCH MODE OF OPERATION, TOP VALUE IS FOR UNSQUELCHED MODE.
2. UNLESS OTHERWISE STATED, CAPACITANCES ARE IN PICOFARADS (UUF), AND RESISTANCES ARE IN OHMS (K=1000 OHMS).
3. DC VOLTAGES ARE MEASURED USING A MOTOROLA DC MULTIMETER, OR EQUIVALENT, AND ARE IN REFERENCE TO CHASSIS GROUND (B-).
4. OPERATING FREQUENCIES:

   f_c = CARRIER FREQUENCY

   f_1 = HI IF FREQUENCY = 16.8 MHz

   f_{o1} = 1ST OSCILLATOR FREQUENCY

   39.733-52.400 MHz (136-174 MHz)

   $f_{o1} = \frac{fc - f1}{3}$

   f_{o2} = 2ND OSCILLATOR FREQUENCY (SEE TABLE 1)

   f_2 = LOW IF FREQUENCY = 455 kHz

5. JUMPER INCLUDED FOR SINGLE-FREQ OPERATION ONLY.
6. WHT-YEL WIRE INCLUDED FOR TWO-FREQ OPERATION ONLY.
7. JUMPER INCLUDED FOR THREE-FREQ OPERATION ONLY.
8. WHT-GRN WIRE INCLUDED FOR FOUR-FREQ OPERATION ONLY.
9. USED ON H33FFN (5 WATT) SERIES ONLY.
10. USED ON "PRIVATE-LINE" MODELS ONLY.
11. JUMPER INCLUDED FOR FIVE-FREQ OPERATION ONLY.
12. GRN-BRN WIRE INCLUDED FOR SIX-FREQ OPERATION ONLY.
13. AVAILABLE ON H23FFN (1.8 WATT) SERIES ONLY.
14. (L) = 136-150.8 MHz
    (M) = 150.8-162 MHz
    (H) = 162-174 MHz

EPD-24887-A

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Receiver Portion
Carrier & "Private-Line" Squelch
Universal Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A87-B
11/15/71-CP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
A	NUD6002AH-1 NUD6003AH-1 NUD6004AH-1 NUD6033AH-1 NUD6034AH-1	C58	WAS 21D82213E07	Q8 EMITTER	NONE
	NUD6102AH NUD6103AH NUD6104AH		NEW MODELS ADDED	PARTS LIST	
A1	NUD6002AH-1 NUD6003AH-1 NUD6004AH-1 NUD6033AH-1 NUD6034AH-1 NUD6102AH NUD6103AH NUD6104AH	L401	DELETED FOR 1, 3, 4, 5, AND 6 FREQ. "PL" MODELS	SWITCH S4	PEPD-24947-O PEPD-24946-O PEPD-24949-O PEPD-25448-O PEPD-25450-O PEPD-25452-O
		L81	WAS 50D83466D02	PARTS LIST	
B	NUD6102AH		NEW MODEL ADDED		

PARTS LIST

NUD6002AH 1.8 watt Unified Board (Rcvr Portion) 136-150.8 MHz
NUD6003AH 1.8 watt Unified Board (Rcvr Portion) 150.8-162 MHz
NUD6004AH 1.8 watt Unified Board (Rcvr Portion) 162-174 MHz
NUD6102AH 1.8 watt Unified Board (Rcvr Portion) 136-150.8 MHz
NUD6103AH L.8 watt Unified Board (Rcvr Portion) 150.8-162 MHz
NUD6032AH 5 watt Unified Board (Rcvr Portion) 136-150.8 MHz
NUD6033AH 5 watt Unified Board (Rcvr Portion) 150.8-162 MHz
NUD6034AH 5 watt Unified Board (Rcvr Portion) 162-174 MHz

(Int'Rmt Models) EPD-25071-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±10%; 75 V; unl stated
C1	21D82877B45 or21D82877B13	11; N150; 136-150.8 MHz 7; N150; 150.8-174 MHz
C2	21K865197 or21K861432	25; N150; 136-150.8 MHz 20; N150; 150.8-174 MHz
C3, 4, 8, 27, 69, 75, 79	21K861436	100; N750 (C75 for 5 watt models only)
C5	21D82450B28 or21D82450B22	1.0; 500 V;136-150.8 MHz 0.75; 500 V;150.8-174 MHz
C6, 10	21K861430 or21D82877B13	10; N150; 136-150.8 MHz 7; N150; 150.8-174 MHz
C7	21K861434 or21K861433	40; N150 136-150.8 MHz 36; N150; 150.8-174 MHz
C9	21D82450B28 or21D82450B24	1.0; 500 V; 136-150.8 MHz 0.47; 150.8-174 MHz
C11, 12, 14, 15, 29	21K861442	0.002 uF +100-20%
C13	21D82877B03	50; N750
C16	21D82877B06 or21K861462 or21D82877B45	30; N150; 136-150.8 MHz 15; N150; 150.8-162 MHz 11; N150; 162-174 MHz
C17	21K861462 or21D82877B45	15; N150; 136-150.8 MHz 11; N150; 150.8-174 MHz
C18	21D82877B08 or21K861426	2.8; NP0; 136-174 MHz 2.2; N150; 150.8-174 MHz
C19, 30	21K861444	0.02 uF +100-20%
C20	21D82358G12	100 ±5%; N080
C23, 64	21D82213E03	.0055 uF +100-20%
C25	21D82358G14	65 ±5%; N080
C26, 32, 36, 37	21D83068E03	0.05 uF ±20%; 12 V
C28	21D82450B28	1; 500 V
C31	21K861433	36; N150
C33	21D83162H09	1000 ±5%; N150
C34	21D82213E04	135 ±5%; 200 V; Y5D
C35	21D82358G29	125 ±5%; 25 V; N220
C38	23D83441B04	2.2 uF ±20%; 6 V
C39	23D82397D21	47 uF ±20%; 6 V
C40	21K861439	345; N2200
C41, 55	23D82397D28	3.3 uF ±20%; 20 V
C42, 58	21D82213E08	1000 ±5%; 100 V; Y5D
C43	21D82428B10	3300; X5R
C44, 48	23D82397D06	0.22 uF +40-20%; 35 V
C45	21D83162H07	2000; NP0
C46, 47, 50, 56, 78	21D82213E07	.0047 uF; 100 V; X5R
C49	21D82213E13	0.0068 uF; 100 V; Y5R
C51, 52, 53, 54	23D83397D21	0.01 uF ±20%; 35 V
C57	23D82397D18	33 uF ±10%; 10 V
C59	21D82877B41	120; N750
C60, 63	23D82397D07	1.0 uF +40-20%; 20 V
C61	21K859202	90; N750
C62, 67, 68	23D82397D15	10 uF ±20%; 20 V
C65	23D82397D08	0.15 uF +40-20%; 35 V
C72, 73		C72 single freq. only, C73 "PL" only, refer to misc. parts kit on back of Xmtr. schematic
C77	21D82877B46	18; N150
C301	21D861427	4.0 for 1 & 2 freq 162-174 only; for 3-freq. and over see misc. parts kit on back of Xmtr. schematic
		SEMICONDUCTOR DEVICE, diode; SEE NOTE I
CR1, 6	48C82363E03	silicon
CR2, 3	48C82178A01	germanium
CR4	48C82392B03 or48C83654H01	silicon silicon (for 5 watt models)
CR5	48C83329G04	3 pellet, silicon; 2 v

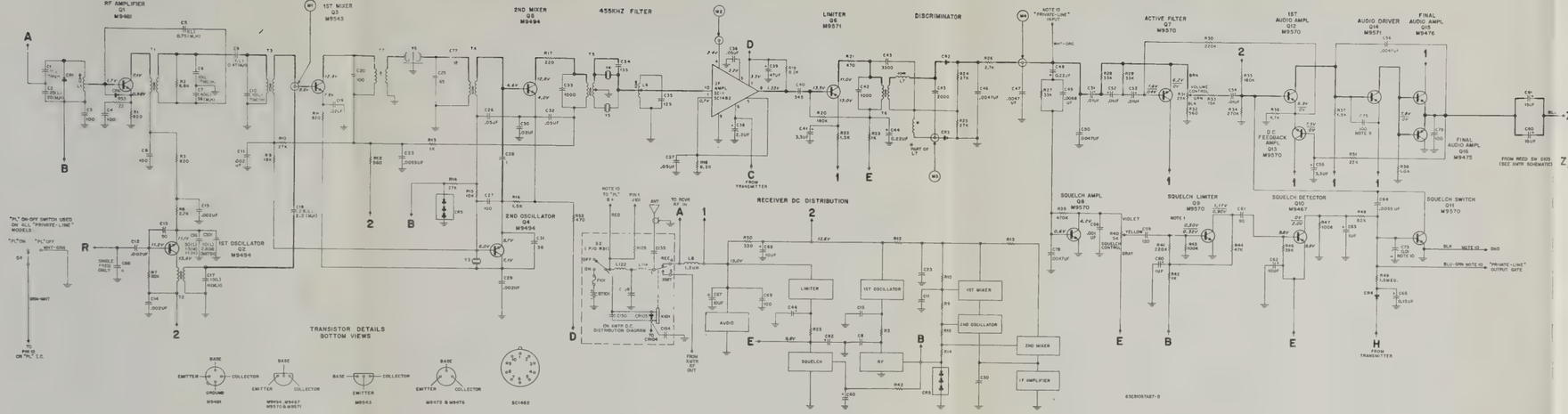
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		INTEGRATED CIRCUIT:
IC1	51R83395E01	IF ampl SC1482
		COIL, RF:
L1	24D83635H01	YEL-BLU; 5-1/4 turns, tap 1.5 turn, 76B82451B09 core, tuning
L2, 301	24D83635H06	YEL-VIO; 12-1/4 turns taped at 1-1/2 turns, 76B82451B08 core, tuning (L301 not used on single freq. models)
L6	24D82559G17	output, 455 kHz
L7	24D84235H01	GRN; 48 turns to 48 turns
L8, 11	24D82723H01	choke; 1.2 uH
L12		remote spkr/mic models only; refer to parts kit on back of xmtr schematic
L401		refer to misc parts list on back of xmtr schematic
		TRANSISTOR: SEE NOTE I
Q1	48R869481	N-P-N; type M9481
Q2, 4, 5	48R869494	N-P-N; type M9494
Q3	48R869543	N-P-N; type M9543
Q6, 14	48R869571	P-N-P; type M9571
Q7, 8, 9, 11, 12, 13	48R869570	N-P-N; type M9570
Q10	48R869467	P-N-P; type M9467
Q15	48R869476	N-P-N; type M9476
Q16	48R869475	P-N-P; type M9475
		RESISTOR, fixed: ohms ±10%; 1/8 W; unl otherwise stated
R1, 3, 11	6S185B78	820
R2	6S185B89	6.8k
R4, 13, 23, 38, 42, 301	6S185B79	1k (R301 not used on single freq. models)
R7, 48	6S185C03	82k
R8, 26	6S185B84	2.7k
R9	6S185B94	18k
R10, 14, 24, 25	6S185B96	27k
R12, 32	6S185B76	560
R15	6S185B91	10k
R16, 22, 37	6S185B81	1.5k
R17	6S185B71	220
R18, 19	6S185B90	8.2k
R20	6S185C07	180k
R21, 52	6S185B75	470
R27, 28, 29	6S185B97	33k
R30, 41	6S185C08	220k
R31, 40		refer to frame and switch kit on back of Xmtr. schematic
R33	6S185B93	15k
R34	6S185B08	270k ±5%
R35	6S185B04	180k ±5%
R36	6S185B87	4.7k
R39	6S185C12	470k
R43, 47	6S185C04	100k
R44	6S185B99	47k
R46	6S185B98	39k
R49	6S185C18	1.5 M
R50	6S185B73	330
R51	6S185B95	22k
R53	6S185B59	22
		SWITCH:
S1		refer to frame and switch kit or sleeve kit on back of Xmtr. schematic
S2, 3		refer to frame and switch kit on back of Xmtr. schematic
S4		refer to misc parts kit on back of Xmtr. schematic

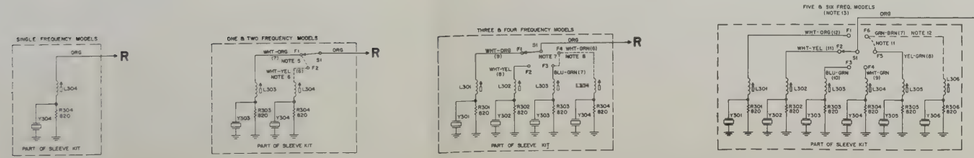
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		TRANSFORMER, RF:
T1	24D83636H02	RED-GRN; 2-1/4 turns to 5-1/4 turns, 76B82451B09 core, tuning
T2, 3	24D83636H01	RED-BLU; 1-1/4 turns to 4-3/4 turns, 76B82451B09 core, tuning
T4	24D83636H04	ORG-GRN; 40-3/4 turns to 10-1/4 turns, 76B82451B04 core, tuning
T5	24D82559G12	input 455 kHz
T6	24D84235H02	CLEAR, 6 turns to 170 turns
T7	24D83636H03	YEL-GRN; 20-1/4 turns to 7-1/4 turns 76B82451B04 core, tuning
		CRYSTAL, quartz: SEE NOTE II
Y1, 301	YMRX-109	
Y3	YNR	see table on front of this schematic
Y4	48D83192C12	ceramic; 458 kHz
Y5	48D83192C11	ceramic; 452 kHz
Y6	FSMA	assem, crystal filter; FSMA 16.8 MHz
NON-REFERENCED ITEMS		
	7B82003J01	SUPPORT; crystal mounting
	39B83610H01	ANTENNA, contact
	26B84800H01	SHIELD, coil
	26B84800H03	SHIELD, coil
	26B84800H05	SHIELD, coil
	26B82671D17	SHIELD, coil
	76A82686D06	SLEEVE, iron
	30B83361G01	CABLE, coax

NOTES:

I. For optimum performance, order replacement diodes and transistors by Motorola part number only.

II. Crystals are part of the radio model only. When ordering crystal units specify carrier frequency(s), crystal frequency(s), and crystal type number. Proper oscillator frequency and crystal type will be found stamped on crystal can.




SINGLE FREQUENCY MODELS
ONE & TWO FREQUENCY MODELS
THREE & FOUR FREQUENCY MODELS
FIVE & SIX FREQ MODELS (NOTE 13)
PART OF SLEEVE KIT

EPD-24887-A

PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Receiver Portion
Carrier & "Private-Line" Squelch
Universal Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A87-B
11/15/71-CP

TRANSMITTER NOTES

1. UNLESS OTHERWISE STATED, CAPACITANCES ARE IN PICOFARADS (UUF), AND RESISTANCES ARE IN OHMS (K = 1000 OHMS).
2. (L) = 136-150.8 MHz, (M) = 150.8-162 MHz, (H) = 162-174 MHz.
3. SEE TABLE 1 FOR SWITCH S1 FUNCTIONS.
4. DC VOLTAGES ARE TAKEN WITH A MOTOROLA DC MULTIMETER, OR EQUIVALENT, AND ARE IN REFERENCE TO CHASSIS GROUND (B-).
5. JUMPER INCLUDED FOR THREE-FREQ OPERATION ONLY.
6. VIOLET WIRE INCLUDED FOR FOUR-FREQ OPERATION ONLY.
7. JUMPER INCLUDED FOR FIVE-FREQ OPERATION ONLY.
8. WHITE WIRE INCLUDED FOR SIX-FREQ OPERATION ONLY.
9. FIVE AND SIX-FREQ MODELS NOT AVAILABLE ON SELECTIVE CALL MODELS.
10. APPLIES TO "PRIVATE-LINE" SQUELCH MODELS (OR SELECTIVE CALL MODELS WITH "PL" TONE ON XMIT) ONLY.
11. NUMBERS WITHIN TRIANGLES INDICATE TIE POINTS TO SELECTIVE CALL CIRCUIT BOARD (SELECTIVE CALL MODELS ONLY).
12. C151 USED ONLY ON SELECTIVE CALL MODELS WITH "PL" TONE ON XMIT.
13. OPERATING FREQUENCIES:

f_c = CARRIER FREQUENCY

f_o = OSCILLATOR FREQUENCY

$f_o = \frac{f_c}{9}$

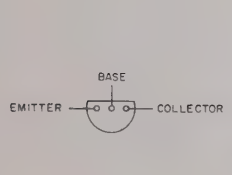
EPD-24888-O

MODEL TABLE

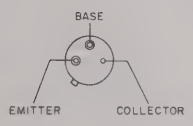
MODEL	CHASSIS SUFFIX	FREQUENCY RANGE
NUD6002AH CHASSIS	4	136 — 150.8 MHZ
NUD6003AH CHASSIS	3	150.8 - 162 MHZ
NUD6004AH CHASSIS	3	162 — 174 MHZ
NUD6102AH CHASSIS	1	136 — 150.8 MHz
NUD6103AH CHASSIS		150.8 — 162 MHz
NUD6104AH CHASSIS		162 — 174 MHz

TABLE 1
S1 FUNCTIONS

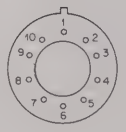
CARR SQUELCH OR SELECTIVE CALL MODELS							"PRIVATE-LINE" SQUELCH MODELS								
2 FREQ		3 & 4 FREQ		5 & 6 FREQ		FUNCTION	2 FREQ			3 & 4 FREQ			5 & 6 FREQ		
PIN	POSITION	PIN	POSITION	PIN	POSITION		PIN	POSITION	FUNCTION	PIN	POSITION	FUNCTION	PIN	POSITION	FUNCTION
6	1	4	1	6	1	F1	6	1	F1-"PL" ON	4	1	F1	6	1	F1
7	2	3	2	5	2	F2	7	2	F1-"PL" OFF	3	2	F2	5	2	F2
		2	3	4	3	F3	8	3	F2-"PL" OF	2	3	F3	4	3	F3
		1	4	3	4	F4	9	4	F2-"PL" ON	1	4	F4	3	4	F4
				2	5	F5	–	–	–				2	5	F5
				1	6	F6	–	–	–				1	6	F6



M9444, M9600 & M9601



M9599



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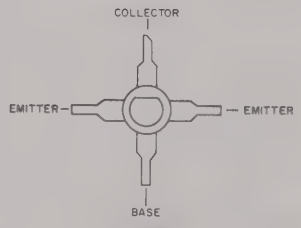
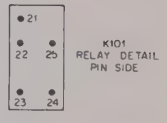
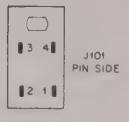


M9588

TRANSISTOR DETAILS BOTTOM VIEW





63E81067A88-C1

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Transmitter Portion
Carrier & "Private-Line" Squelch
Internal & Remote Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A88-C1
11/15/71-CP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
A	NUD6002AH-1 NUD6003AH-1 NUD6004AH-1 NUD6103AH-1 NUD6104AH-1	C58	WAS21D82213E07	Q8 EMITTER	NONE
	NUD6102AH NUD6103AH NUD6104AH		NEW MODELS ADDED	PARTS LIST	
B	NUD6002AH-1 NUD6003AH-1 NUD6004AH-1 NUD6033AH-1 NUD6034AH-1	L401	DELETED FOR ALL UNIVERSAL 'PL' MODELS	SWITCH S4	PEPD-24949-O PEPD-25452-O
	NUD6102AH NUD6103AH NUD6104AH	L5[1]	WAS 50D83466D02	PARTS LIST	
B	NUD6032AH		NEW MODELS ADDED		

PARTS LIST

NUD6002AH 1.8 watt Unified Board (Rcvr Portion) 136-150.8 MHz
NUD6003AH 1.8 watt Unified Board (Rcvr Portion) 150.8-162 MHz
NUD6004AH 1.8 watt Unified Board (Rcvr Portion) 162-174 MHz
NUD6102AH 1.8 watt Unified Board (Rcvr Portion) 136-150.8 MHz
NUD6103AH 1.8 watt Unified Board (Rcvr Portion) 150.8-162 MHz
NUD6104AH 1.8 watt Unified Board (Rcvr Portion) 162-174 MHz
NUD6032AH 5 watt Unified Board (Rcvr Portion) 136-150.8 MHz
NUD6033AH 5 watt Unified Board (Rcvr Portion) 150.8-162 MHz
NUD6034AH 5 watt Unified Board (Rcvr Portion) 162-174 MHz
(Universal Models) EPD-25070-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±10%; 75 V; unl stated
C1	21D82877B45 or21D82877B13	11; N150; 136-150.8 MHz 7; N150; 150.8-174 MHz
C2	21K865197 or21K861432	25; N150; 136-150.8 MHz 20; N150; 150.8-174 MHz
C3, 4, 8, 27, 69, 75, 79	21K861436	100; N750 (C75 for 5 watt models only)
C5	21D82450B28 or21D82450B22	1.0; 500 V; 136-150.8 MHz 0.75; 500 V; 150.8-174 MHz
C6, 10	21K861430 or21D82877B13	10; N150; 136-150.8 MHz 7; N150; 150.8-174 MHz
C7	21K861434 or21K861433	40; N150; 136-150.8 MHz 36; N150; 150.8-174 MHz
C9	21D82450B28 or21D82450B24	1.0; 500 V; 136-150.8 MHz 0.47; 150.8-174 MHz
C11, 12, 14, 15, 29	21K861442	0.002 uF +100-20%
C13	21D82877B03	50; N750
C16	21D82877B06 or21K861462 or21D82877B45	30; N150; 136-150.8 MHz 15; N150; 150.8-162 MHz 11; N150; 162-174 MHz
C17	21K861462 or21D82877B45	15; N150; 136-150.8 MHz 11; N150; 150.8-174 MHz
C18	21D82877B08 or21K861426	2.8; NP0; 136-174 MHz 2.2; N150; 150.8-174 MHz
C19, 30	21K861444	0.02 uF +100-20%
C20	21D8258C12	100 ±5%; N080
C23, 64	21D82213E03	.0055 uF +100-20%
C25	21D82358C14	65 ±5%; N080
C26, 32, 86, 37	21D83068E03	0.05 uF ±20%; 12 V
C28	21D82450B28	1; 500 V
C31	21K861433	36; N150
C33	21D83162H09	1000 ±5%; N150
C34	21D82213E04	135 ±5%; 200 V; Y5D
C35	21D8258G29	125 ±5%; 25 V; NZZ0
C38	23D83441B04	2.2 uF ±20%; 6 V
C39	23D82397D21	47 uF ±20%; 6 V
C40	21K861439	345; NZZ00
C41, 55	23D82397D28	3.3 uF ±20%; 20 V
C42, 58	21D82213E08	1000 ±5%; 100 V; Y5D
C43	21D82428B10	3300; X5R
C44, 48	23D82397D06	0.22 uF +40-20%; 35 V
C45	21D83162H07	2000; NP0
C46, 47, 50, 56, 78	21D82213E07	.0047 uF; 100 V; X5R
C49	21D82213E13	0.0068 uF; 100 V; Y5R
C51, 52, 53, 54	23D83397D21	0.01 uF ±20%; 35 V
C59	21D82877B41	120; N750
C60, 63	23D82397D07	1.0 uF +40-20%; 20 V
C61	21K859202	90; N750
C62, 67, 68	23D82397D15	10 uF ±20%; 20 V
C65	23D82397D08	0.15 uF +40-20%; 35 V
C73, 80, 81, 86, 301		refer to misc parts kit on back of Xmtr. schematic
C77	21D82877B46	18; N150
		SEMICONDUCTOR DEVICE, diode: SEE NOTE I
CR1, 6	48C82363E03	silicon
CR2, 3	48C82178A01	germanium
CR4	48C82392B03 or48C83654H01	silicon silicon (5 watt models only)
CR5	48C83329G04	3 pellet, silicon; 2 V
		INTEGRATED CIRCUIT:
IC1	51R83395E01	IF AMP-SC1482

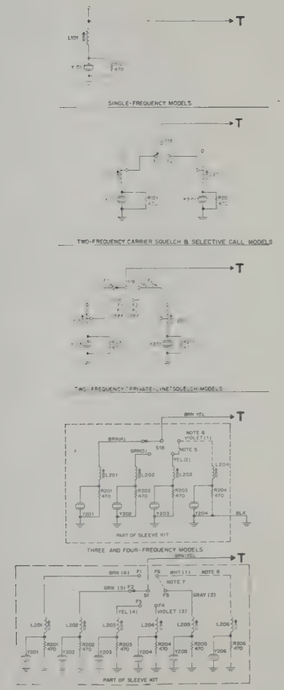
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L1	24D83635H01	COIL, RF: unl stated YEL-BLU; 5-1/4 turns, tap 1.5 turn, 76B82451B09 core, tuning
L6	24D82559G17	output, 455 kHz
L7	24D84235H01	GRN; 48 turns to 48 turns
L8	24D82723H01	Choke; 1.2 uH
L401		refer to misc parts list on back of Xmtr. schematic
Q1	48R869481	TRANSISTOR: SEE NOTE I N-P-N; type M9481
Q2, 4, 5	49R869494	N-P-N; type M9494
Q3	48R869543	N-P-N; type M9543
Q6, 14	48R869571	P-N-P; type M9571
Q7, 8, 9, 11, 12, 13	48R869570	N-P-N; type M9570
Q10	48R869467	P-N-P; type M9467
Q15	48R869476	N-P-N; type M9476
Q16	48R869475	P-N-P; type M9475
		RESISTOR, fixed: Ω ±10%; 1/8 W unless stated
R1, 3, 11	6S185B78	820
R2	6S185B89	6.8k
R7, 48	6S185C03	82k
R8, 26	6S185B84	2.7k
R9	6S185B94	18k
R10, 14, 24, 25	6S185B96	27k
R12, 32	6S185B76	560
R13, 23, 38, 42	6S185B79	1k
R15	6S185B91	10k
R16, 22, 37	6S185B81	1.5k
R17	6S185B71	220
R18, 19	6S185B90	8.2k
R20	6S185C07	180k
R21, 52	6S185B75	470
R27, 28, 29	6S185B97	33k
R30, 41	6S185C08	220k
R31, 40		refer to frame and switch kit on back of Xmtr. schematic
R33	6S185B93	15k
R34	6S185B08	270k ±5%
R35	6S185B04	180k ±5%
R36	6S185B87	4.7k
R39	6S185C12	470k
R43, 47	6S185C04	100k
R44	6S185B99	47k
R46	6S185B98	39k
R49	6S185C18	1.5 M
R50	6S185B73	330
R51	6S185B95	22k
R53	6S185B59	22
S2		SWITCH: refer to frame and switch kit on back of Xmtr. schematic
S4		refer to misc parts kit on back of Xmtr. schematic
T1	24D83636H02	TRANSFORMER, RF: RED, GRN; 2-1/4 turns to 5-1/4 turns, 76B82451B09 core, tuning
T2, 3	24D83636H01	RED-BLU; 1-1/4 turns to 4-3/4 turns, 76B82451B09 core, tuning
T4	24D83636H04	ORG-GRN; 40-3/4 turns to 10-1/4 turns, 76B82451B04 core, tuning
T5	24D82559G12	input 455 kHz
T6	24D84235H02	CLEAR. 6 turns to 170 turns
T7	24D83636H03	YEL-GRN; 20-1/4 turns to 7-1/4 turns, 76B82451B04 core, tuning

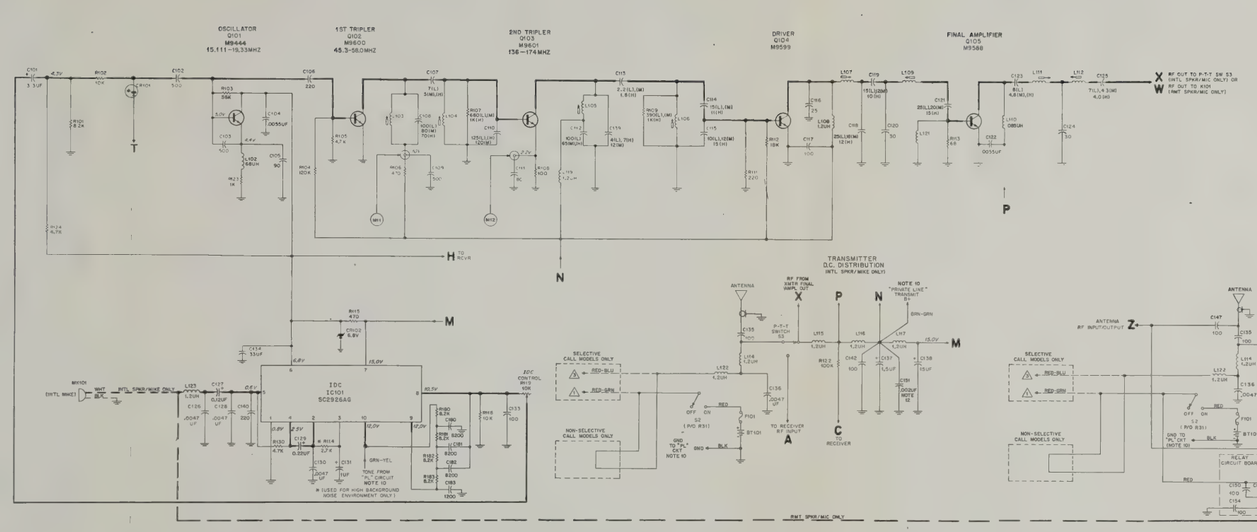
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Y3	YNR	CRYSTAL, quartz: SEE NOTE II see table on front of this schematic
Y4	48D83192C12	ceramic; 458 kHz
Y5	48D82192C11	ceramic; 452 kHz
Y6	FSMA	assem, crystal filter; FSMA; 16.8 MHz
NON-REFERENCED ITEMS		
	7B82003J01	SUPPORT, crystal mounting
	39B83610H01	ANTENNA, contact
	26B84800H01	SHIELD, coil
	26B84800H03	SHIELD, coil
	26B84800H05	SHIELD, coil
	26B82671D17	SHIELD, coil
	76A82686D06	SLEEVE, iron
	30B83361G01	CABLE, coax.

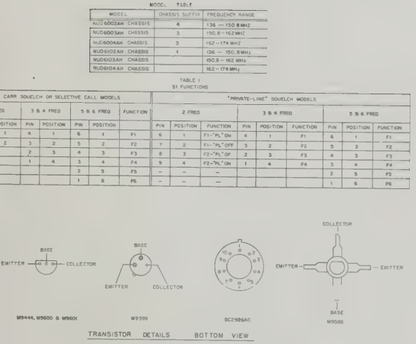
NOTES:

I. For optimum performance, order replacement diodes and transistors by Motorola part number only.

II. Crystals are part of the radio model only. When ordering crystal units specify carrier frequency(s), crystal frequency(s) and crystal type number. Proper oscillator frequency and crystal type will be found stamped on crystal can.


SINGLE-FREQUENCY MODELS
TWO-FREQUENCY CARRIER SQUELCH & SELECTIVE CALL MODELS
"NO FREQUENCY-PRIVATE-LINE" SQUELCH MODELS
THREE AND FOUR-FREQUENCY MODELS
PART OF SLEEVE KIT





MODEL	CHASSIS SUFFIX	FREQUENCY RANGE
NUC6002AK CHASSIS	4	136 — 150.8 MHz
NUC6003AK CHASSIS	5	150.8 — 162 MHz
NUC6004AK CHASSIS	3	162 — 174 MHz
NUD5002AK CHASSIS	1	136 — 150.8 MHz
NUD5003AK CHASSIS		150.8 — 162 MHz
NUD5004AK CHASSIS		162 — 174 MHz

TABLE I
S1 FUNCTIONS

CARR SQUELCH OR SELECTIVE CALL MODELS						"PRIVATE-LINE" SQUELCH MODELS								
2 FREQ		3 & 4 FREQ		5 & 6 FREQ	FUNCTION	2 FREQ			3 & 4 FREQ			5 & 6 FREQ		
P/N	POSITION	P/N	POSITION	P/N	POSITION	P/N	POSITION	FUNCTION	P/N	POSITION	FUNCTION	P/N	POSITION	FUNCTION
6	1	6	1	6	F1	6	1	F1-"PL" ON	6	1	F1	6	1	F1
7	2	5	2	5	F2	7	2	F1-"PL" OFF	5	2	F2	5	2	F2
		2	3	4	F3	8	3	F2-"PL" ON	2	3	F3	4	3	F3
		1	4	3	F4	9	4	F2-"PL" ON	1	4	F4	3	4	F4
			5	2	F5	-	-	-				2	5	F5
			6	1	F6	-	-	-				1	6	F6

TRANSMITTER NOTES

1. UNLESS OTHERWISE STATED, CAPACITANCES ARE IN PICOFARADS (UUF), AND RESISTANCES ARE IN OHMS (K = 1000 OHMS).
2. (L) = 136-150.8 MHz. (M) = 150.8-162 MHz. (H) = 162-174 MHz.
3. SEE TABLE I FOR SWITCH S1 FUNCTIONS.
4. DC VOLTAGES ARE TAKEN WITH A MOTOROLA DC MULTIMETER, OR EQUIVALENT, AND ARE IN REFERENCE TO CHASSIS GROUND (B-).
5. JUMPER INCLUDED FOR THREE-FREQ OPERATION ONLY.
6. VIOLET WIRE INCLUDED FOR FOUR-FREQ OPERATION ONLY.
7. JUMPER INCLUDED FOR FIVE-FREQ OPERATION ONLY.
8. WHITE WIRE INCLUDED FOR SIX-FREQ OPERATION ONLY.
9. FIVE AND SIX-FREQ MODELS NOT AVAILABLE ON SELECTIVE CALL MODELS.
10. APPLIES TO "PRIVATE-LINE" SQUELCH MODELS (OR SELECTIVE CALL MODELS WITH "PL" TONE ON XMIT) ONLY.
11. NUMBERS WITHIN TRIANGLES INDICATE TIE POINTS TO SELECTIVE CALL CIRCUIT BOARD (SELECTIVE CALL MODELS ONLY).
12. C151 USED ONLY ON SELECTIVE CALL MODELS WITH "PL" TONE ON XMIT.
13. OPERATING FREQUENCIES

$$f_c = f_o \pm f_r$$

(f_c = CARRIER FREQUENCY)
(f_o = OSCILLATOR FREQUENCY)
(f_r = REFERENCE FREQUENCY)

EPD-24888-O

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Transmitter Portion
Carrier & "Private-Line" Squelch
Internal & Remote Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A88-C1
11/15/71-CP

R

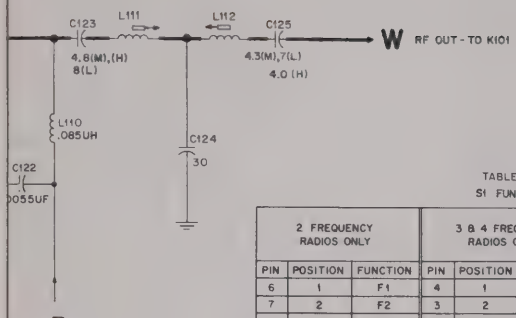
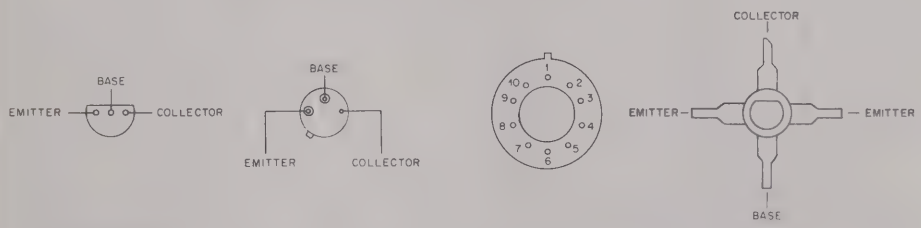


TABLE 1
S1 FUNCTIONS

2 FREQUENCY RADIOS ONLY			3 & 4 FREQUENCY RADIOS ONLY			5 & 6 FREQUENCY RADIOS ONLY		
PIN	POSITION	FUNCTION	PIN	POSITION	FUNCTION	PIN	POSITION	FUNCTION
6	1	F1	4	1	F1	6	1	F1
7	2	F2	3	2	F2	5	2	F2
–	–	–	2	3	F3	4	3	F3
–	–	–	1	4	F4	3	4	F4
–	–	–	–	–	–	2	5	F5
–	–	–	–	–	–	1	6	F6

MODEL TABLE

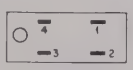
MODEL	CHASSIS SUFFIX	FREQUENCY RANGE
NUD6002AH CHASSIS	4	136–150.8 MHZ
NUD6003AH CHASSIS	3	150.8–162 MHZ
NUD6004AH CHASSIS	3	162–174 MHZ
NUD6102AH CHASSIS	1	136–150.8 MHz
NUD6103AH CHASSIS		150.8–162 MHz
NUD6104AH CHASSIS		162–174 MHz



M9444, M9600, & M9601 M9599 SC2926AG M9588

TRANSISTOR DETAILS BOTTOM VIEW

K101
RELAY DETAIL
PIN SIDE



J101 DETAIL
PIN SIDE

ANSMITTER NOTES

ATED, CAPACITANCES ARE IN PICOFARADS
ES ARE IN OHMS (K = 1000 OHMS).
) = 150.8-162 MHz, (H) = 162-174 MHz.
CH S1 FUNCTIONS.
EN WITH A MOROTOLA DC MULTIMETER,
ARE IN REFERENCE TO CHASSIS GROUND (B-).
THREE-FREQ OPERATION ONLY.
FOR FOUR-FREQ OPERATION ONLY.
FIVE-FREQ OPERATION ONLY.
FOR SIX-FREQ OPERATION ONLY.
LINE" SQUELCH MODELS ONLY.
IFS:
CY

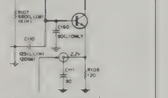
UENCY

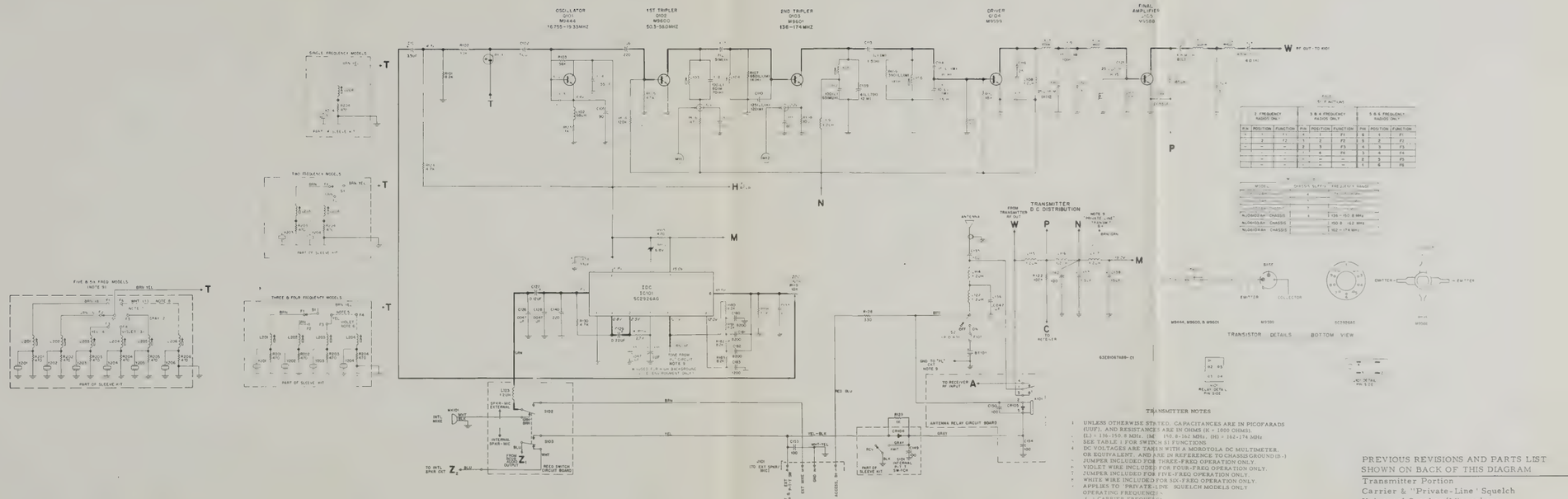
PREVIOUS REVISIONS AND PARTS LIST
SHOWN ON BACK OF THIS DIAGRAM

Transmitter Portion
Carrier & "Private-Line" Squelch
Universal Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A89-C1
11/15/71-CP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
A	NUD6002AH-2	R104A	ADDED 68185C13	ACROSS R104	PEPD-24945-A
	NUD6003AH-2	R108A	ADDED 68185B79	ACROSS R108	PEPD-24946-A
	NUD6004AH-2	R112A	ADDED 68185C04	ACROSS R112	PEPD-24947-A
					PEPD-24949-A
B	NUD6002AH-3	R104A	REMOVED. WAS 68185C13. fixed: 560k ±10%, 1/8 W	ACROSS R104	PEPD-24945-B
	NUD6003AH-3				PEPD-24946-B
	NUD6004AH-3				PEPD-24947-B
		R104	WAS 68185C07, 180k	Q102 BASE	PEPD-24949-B
		R108A	REMOVED. WAS 68185B79, fixed: 1k ±10%, 1/8 W	ACROSS R108	
		R108	WAS 68185B79	Q103 EMITTER	
		R112A	REMOVED. WAS 68185C04, fixed: 100k ±10%, 1/8 W	ACROSS R112	
		R112	WAS 68185B75, 22k	Q104 BASE	
			ADDED NEW CHASSIS/SUFFIX NO.	PARTS LIST	NONE
B1	NUD6002AH-3		ADDED PARTS LIST EPD-24949-B	PARTS LIST	NONE
	NUD6003AH-3				
	NUD6004AH-3				
	NUD6102AH				
	NUD6103AH				
	NUD6104AH				
B2	NLN6903A	R[illegible]	WERE 68185B75	PARTS LIST	NONE
	NLN6905A	R[illegible]			
	NLN6913A	R[illegible]	WERE 68185B78		
B3	NLN8051A	S4	WAS 40A8205B02	PARTS LIST	NONE
	NLN8052A				
	NLN8053A				
B4	NLN8071A	L401	REMOVED	PARTS LIST	NONE
	NLN8046A				
	NLN8048A				
	NLN8072A				
	NLN8053A				
	NLN6947C	L501	WAS 90D8346B02	PARTS LIST	NONE
	NLN6680C				
	NLN6781C				
	NLN6792C				
C	NUD6002AH-4	[illegible]	WAS 21D8287B13, 7 pF, 136-150.8 MHz.	PARTS LIST	PEPD-24945 PEPD-24946 PEPD-24947 PEPD-24949
	NUD6102AH-1	[illegible]	AFMOVED 21K8B4012, 60 pF, 136-150.8 MHz. CIRCUIT WAS AS SHOWN BELOW		





2 FREQUENCY RADIOS ONLY			3 & 4 FREQUENCY RADIOS ONLY			5 & 6 FREQUENCY RADIOS ONLY		
P/N	POSITION	FUNCTION	P/N	POSITION	FUNCTION	P/N	POSITION	FUNCTION
1	1	F1	1	1	F1	1	1	F1
2	2	F2	2	2	F2	2	2	F2
–	–	–	3	3	F3	3	3	F3
–	–	–	4	4	F4	4	4	F4
–	–	–	–	–	–	5	5	F5
–	–	–	–	–	–	6	6	F6

MODEL	CHASSIS PART #	FREQUENCY RANGE
MLD9610AH	CHASSIS	136 – 150.8 MHz
MLD9610AH	CHASSIS	150.8 – 162 MHz
MLD9610AH	CHASSIS	162 – 174 MHz

63E81067A89-O1

TRANSMITTER NOTES

1. UNLESS OTHERWISE STATED, CAPACITANCES ARE IN PICOFARADS (UUF), AND RESISTANCES ARE IN OHMS (K = 1000 OHMS).
2. (L) = 136-150.8 MHz, (M) = 150.8-162 MHz, (N) = 162-174 MHz
3. SEE TABLE 1 FOR SWITCH S1 FUNCTIONS.
4. DC VOLTAGES ARE TAKEN WITH A MOTOROLA DC MULTIMETER, OR EQUIVALENT, AND ARE IN REFERENCE TO CHASSIS GROUND (B-).
5. JUMPER INCLUDED FOR THREE-FREQ OPERATION ONLY.
6. VIOLET WIRE INCLUDED FOR FOUR-FREQ OPERATION ONLY.
7. JUMPER INCLUDED FOR FIVE-FREQ OPERATION ONLY.
8. WHITE WIRE INCLUDED FOR SIX-FREQ OPERATION ONLY.
9. APPLIES TO "PRIVATE-LINE" SQUELCH MODELS ONLY

OPERATING FREQUENCY:

f_o = CARRIER FREQUENCY

f_c = OSCILLATOR FREQUENCY

$f_c = \frac{f_o}{6}$

FPN-24869-O

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Transmitter Portion
Carrier & "Private-Line" Squelch
Universal Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A89-C1
11/15/71-CP

JOTOROLA PART NO.	DESCRIPTION

eve C4R4 C3R3 Universal Carr Sq (1.8 & 5.0 W)
eve C1R1 Carr Universal Sq (1.8 & 5.0 W)
eve C2R2 C2R1 Universal Carr Sq (1.8 & 5.0 W)
eve C1R1 Universal "PL" Sq (1.8 & 5.0 W)

EPD-23604-D

K861437	CAPACITOR, fixed: pF 100 ±10%; 75 V
	SEMICONDUCTOR DEVICE, diode: (SEE NOTE 1)
C82392B03	silicon junction RD1343
	COIL, RF:
D83638H14	CODED; BLU-VIO 23 turns 76B82451B09 core, tuning
D83638H13	CODED; RED-BLU 9-1/2 turns 76B82451B08 core, tuning
	RESISTOR, fixed: Ω ±10%; 1/4 W; unless stated
127802	1k
127801	470
129432	820
	SWITCH, rotary:
C83471H05	2 position, (NLN6868A only)
0C83471H03	4 position, 2 pole (NLN6853A only)
80789A23	P-T-T, include 14A83568H01 insulator
	CRYSTAL, quartz: (SEE NOTE 2)
SR-83	136-174 MHz (1.8 watt models only)
BSR-83	150.8-174 MHz (5 watt models only)
ON-REFERENCED ITEMS	
B83553H03	BUSHING, actuator
83551H01	BRACKET, switch
C83130H03	BUTTON, switch actuator (male)
3C83130H02	BUTTON, switch actuator (NLN6876A)
A83569H01	SLEEVE, switch
A83567H01	SPRING, compression
IA82680D03	SPRING, compression (NLN6867A)
B82591C02	PIN, roll
83570H01	NUT, special (1/4-32)
84274H01	SUPPORT, crystal mounting
C84135H01	KNOB, control
83174C02	SCREW, set
D84270H01	HOUSING, frame (NLN6853A, 6868A)
D84270H02	HOUSING, frame (NLN6867A)
E84484H02	HOUSING, frame (NLN6876A)
B82172J01	GASKET, (Carrier Sq.)
B82172J02	GASKET, ("PL")

NLN8044A Frame and Switch Universal Carr Sq
NLN8045A Frame and Switch Universal "PL" Sq

EPD-25024-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C153	21K861437	CAPACITOR, fixed: 100 pf ±10%; 75 v
J101	64B84361H01	JACK: Male: 4 contact
L122	24D82723H01	COIL, RF: choke; 1.2 uh
R31	1V80700C65	RESISTOR, variable: assem incl 18C83561H02 var: 25K ±10%; .25 w and reference parts S2, L122
R40	1V80700C64	assem incl 18C83560H01 var: 5K ±10%; .35 w
S2		SWITCH: p/o of R31
NON-REFERENCED ITEMS		
	7D83124H01	FRAME: (NLN8044A)
	7D83342H01	FRAME: (NLN8045A)

NLN8040A Reed Switch

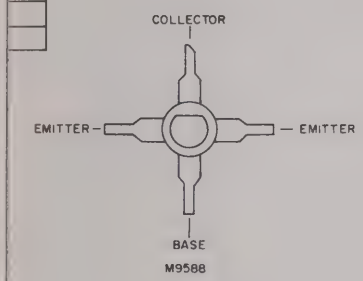
EPD-25023-A

L123	24D82723H01	COIL: choke, 1.2 uH
S102, 103	40C84359H01	SWITCH, reed: contact configuration, 1 form "C"
NON-REFERENCED ITEMS		
	84C84290H01	BOARD, circuit
	22A84292H01	PIN, wire

instruction manual revision FMR-164A

For 68P81067A85-A
Replace diagram 63E81067A89-C1 with this diagram 63E81067A89-C2

5 & 6 FREQUENCY RADIOS ONLY	
POSITION	FUNCTION
1	F1
2	F2
3	F3
4	F4
5	F5
6	F6



N PICOFARADS
MS).
.74 MHz.

ULTIMETER,
MS GROUND (B-).
NLY.
N ONLY.
LY.
NLY.
LY.

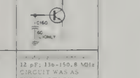
4889-O

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Transmitter Portion
Carrier & "Private-Line" Squelch
Universal Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A89-C2
1/25/72 -GCC

REVISIONS

DIAG ISSUE	CHASSIS AND SUFFIX NO.	REF SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
A	NUD6002AH-2	R104A	ADDED 6S185C13	ACROSS R104	PEPD-24945-A
	NUD6003AH-2	R108A	ADDED 6S185B79	ACROSS R108	PEPD-24946-A
	NUD6004AH-2	R112A	ADDED 6S185C04	ACROSS R112	PEPD-24947-A PEPD-24948-A
B	NUD6002AH-3	R104A	REMOVED. WAS 6S185C13, fixed: 560Ω ±10%, 1/8 W	ACROSS R104	PEPD-24945-B PEPD-24946-B PEPD-24947-B
	NUD6003AH-3				
	NUD6004AH-3				
	NUD6102AH	R104	WAS 6S185C07, 180Ω	Q102 BASE	PEPD-24949-B
	NUD6104AH	R108A	REMOVED. WAS 6S185B79, fixed: 1k ±10%, 1/8 W	ACROSS R108	
		R112A	ADDED 6S185C04	Q103 EMITTER	
		R112A	REMOVED. WAS 6S185C04, fixed: 100k ±10%, 1/8 W	ACROSS R112	
		-	WAS 6S185B75, 32k	Q104 BASE	
		-	ADDED NEW CHASSIS PARTS LIST FOR 6-DIGIT MODELS	PARTS LIST	NONE
B1	NLN6851A	R127	WAS 6S185B74	PARTS LIST	NONE
	NLN6854A	R201 THRU R306	WERE 6S185B74		
	NLN6856A				
	NLN6858A		WERE 6S185B74		
	NLN6861A				
	NLN6877A				
	NLN6881A				
B2	NLN6852A	S4	WAS 40A829010B2	PARTS LIST	NONE
	NLN6856A				
	NLN6870A				
	NLN6876A				
B3	NLN8554A	C4-6, 8-9	REMOVED	PARTS LIST	NONE
	NLN8556A				
	NLN8570A				
	NLN8576A				
B4	NLN6851C	S2	WAS 90D834ND2	PARTS LIST	
	NLN6856C				
	NUD6002AH-4		WAS 21DB4877B13, 2pF, 1% -150.8 MHz	PARTS LIST	PEPD-24945-C PEPD-24946-C PEPD-24947-C PEPD-24948-C
	NUD6104AH-1		REMOVED 21K864012, 60 pF; 1% -150.8 MHz. CIRCUIT WAS AS SHOWN BELOW.		
C	NLN6877A	S2	WAS 15C831321H03 or 15D853939H02	PARTS LIST	NONE
	NLN6878A		OVERO ADDED 30A2554201 LABEL, 5490284201 LABEL, BATTERY		
		CR101	48C822190H09		
		CR102	48C822560C47		
		IC101	51R833956E02		
		L102	24D852490D13		



PARTS LIST

NUD6002AH 1.8 watt Unified Board (Xmtr. Portion) 136-150.8 MHz
NUD6003AH 1.8 watt Unified Board (Xmtr. Portion) 150.8-162 MHz
NUD6006AH 1.8 watt Unified Board (Xmtr. Portion) 162-174 MHz
NUD6102AH 1.8 watt Unified Board (Xmtr. Portion) 136-150.8 MHz
NUD6103AH 1.8 watt Unified Board (Xmtr. Portion) 150.8-162 MHz
NUD6104AH 1.8 watt Unified Board (Xmtr. Portion) 162-174 MHz

EPD-25026-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±10%; 75 V, unless stated
C101	23D82397D28	3.3 uF ±20%, 20 V
C102, 103, 109	21K861441	500; N4700
C104, 122	21D822130E03	.0055 uF ±100-0%; Y5D
C105	21K859202	90; N750
C106	21K858882	220; N1400
C107	21D82877B13 or21D82377B21	7; N150; 136-150.8 MHz 5; N150; 150.8-174 MHz
C108	21D82336G12	100 ±5%; N080; 136-150.8 MHz
C110	21K864067 or21K861435	80; N150; 150.8-162 MHz 70; N150; 162-174 MHz
C111	21D82336G18	125; NP0; 136-150.8 MHz 162-174 MHz
C112	21D82877B15 or21D82377B32	120; N150; 150.8-174 MHz 80; NP0
C114	21K861436 or21D82150G14	100; N750; 136-150.8 MHz 65; N080; 150.8-174 MHz
C113	21K861426	2.2; N150; 136-162 MHz
C114	21D82450B27 21K861462 or21D82877B45	1.5; 162-174 MHz 15; N150; 136-162 MHz 11; N150; 162-174 MHz
C115	21K861430 or21K861431 or21K861462	10; N150; 136-150.8 MHz 12; N150; 150.8-162 MHz 15; N150; 162-174 MHz
C116	21K865197	25; N150
C117, 133, 135, 142, 153	21K861437	100; N2200
C118	21K865197 or21D82877B46 or21K861431 21K861462 or21K861431 or21D82877B23	25; N150; 136-150.8 MHz 18; N150; 150.8-162 MHz 12; N150; 162-174 MHz 15; N150; 136-150.8 MHz 12; N150; 150.8-162 MHz 10; N150; 162-174 MHz
C120, 124	21D82877B06	30; N150
C121	21K865197 or21K861432 or21K861462	25; N150; 136-150.8 MHz 20; N150; 150.8-162 MHz 15; N150; 162-174 MHz
C123	21K867807 or21D82150G02	8; N080; 136-150.8 MHz 4.8; NP0; 150.8-174 MHz
C125	21D82877B13 or21D82377B37	7; N150; 136-150.8 MHz 4.3; NP0; 150.8-162 MHz
	21K861427 or21K861431	4; N150; 162-174 MHz 4; N150; 162-174 MHz
C126, 128, 130, 136	21D82213E07	4700; 100 V; X5R
C127	23D82397D12	.12 uF; 20 V
C129	23D82397D06	.22 uF +40-20%; 35 V
C131	23D82397D07	1 uF; 20 V
C134	23D82397D18	33 uF; 10 V
C137	23D82397D27	1.5 uF; 20 V
C138	23D82397D17	15 uF; 20 V
C139	21K861427 or21K861431 or21D82877B13	4; N150; 136-150.8 MHz 12; N150; 150.8-162 MHz 7; N150; 162-174 MHz
C140	21K861438	220; N1400
C180, 181, 182	21D84008H04	8200; 50 V
C183	21D82213E14	1200 ±5%; 100 V; Y5D
CR101	48C822190H09	SEMICONDUCTOR DEVICE, diode: SEE NOTE I varactor, silicon IN3182
CR102	48C822560C47	zener, silicon; 6.8 V
IC101	51R833956E02	INTEGRATED CIRCUIT: I. D. C. -SC2926AG
L102	24D852490D13	COIL, RF: choke; 68 uH

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L103	24D83638H03	coded, BLU-GRN; 4-1/4 turns 76B82451B07 core, tuning
L104	24D83638H04	coded, BRN; 3-1/4 turns 76B82451B07 core, tuning
L105	24D83638H05 or24D83638H07	coded, GRN; 5-1/4 turns 76B82451B07 core, tuning (136-150.8 MHz) coded, YEL; 3-3/4 turns 76B82451B07 core, tuning (150.8-174 MHz)
L106	24D83638H07	coded, YEL; 3-3/4 turns 76B82451B07 core, tuning
L107	24D83638H06	coded, ORG-BRN; 2-3/4 turns 76B82451B07 core, tuning
L108, 114, 115, 116, 117, 119	24D82723H01	choke, 1.2 uH
L109	24D83638H08	coded, BRN-RED; 3-1/2 turns 76B82451B07 core, tuning
L110	24D82723H18	choke, .085 uH
L111, 112	24D83638H09	coded, ORG-BLU; 8-1/4 turns 76B82451B09 core, tuning
L121 L122	24C83961B01	choke, BRN; 3 turns Refer to frame and switch kits TRANSISTOR: SEE NOTE I
Q101	48R869444	N-P-N; type M9444
Q102	48R869600	N-P-N; type M9600
Q103	48R869601	N-P-N; type M9601
Q104	48R869599	N-P-N; type M9599
Q105	48R869588	N-P-N; type M9588
R101	6S185B90	RESISTOR, fixed: ±10%; 1/8 W; unless stated 8.2k
R102, 118	6S185B91	10k
R103	6S185C01	56k
R104	6S185C05	120k
R105	6S185B87	4.7k
R106	6S185B75	470
R107	6S185B77 or6S185B79 6S185B67	680; 136-162 MHz 1k; 162-174 MHz 100
R108	6S185B79	1k; 162-174 MHz
R109	6S185B79 or6S185B74	1k; 162-174 MHz 390; 136-162 MHz
R111	6S185B71	220
R112	6S185B44	18k
R113	6S185B65	68
R114	6S185B84	2.7k
R115	6S127601	470; 1/4 W
R119	18C82876B06	var, 10k
R122	6S185C04	100k
R123	6S185B79	1k
R124	6S185B87	4.7k
R130	6S185A65	4.7k ±5%
R180, 181, 182, 183	6S185A71	8.2k ±5%

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	15C842691H02 15D845111H02 3A82210E09 3A82210E05 4C82418B09 32B82172J01	COVER, back; NLN6852B COVER, back; NLN6848B SCREW, captive, 2 req'd SCREW, captive, 2 req'd WASHER, nylon, 4 req'd GASKET

NLN6852B Kit, Back Cover
NLN6848B Kit, Back Cover

EPD-24981-O

NLN6851C Front Cover, Universal, Carrier Squelch, Omni-Housing
NLN6856C Front Cover, Universal, Private-Line, Omni-Housing

EPD-24980-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C46, 8+	23C82397D16	CAPACITOR, fixed: 22.0 uF ±20%; 15 V
F101	65B82895B04	FUSE, cartridge: miniature, 2.0 amp; 125 V
LS1	50D83466D05	SPEAKER, dynamic: 2" dia. impedd: 35Ω.
MK101		MICROPHONE, dynamic: res 630Ω; impedance 3500, at 1 kHz (not field repairable; for replacement order complete front cover)
NON-REFERENCED ITEMS		
	14B82282J01	INSULATOR, speaker
	4K840914	WASHER, springs; 2 req'd
	4K848065	WASHER, retaining; 2 req'd
	32B82172J02	GASKET, "O" ring; NLN6856C
	or32B82172J01	GASKET, "O" ring; NLN6851C
	42B84809H01	CLAMP
	14A82392E05	INSULATING TAPE, cover; 2 req'd
	31B03503D01	NAMEPLATE
	7B84030H03	BRACKET, retaining
	41B84029H01	SPRING, latch
	1V80786A80	ASSY, lead and lug (RED)
	1V80786A81	ASSY, lead and lug (BLK)
	1V80791A99	ASSY, lead and lug (BLU)
	or1V80786A82	ASSY, lead and lug (BLU)
	1)3268710	LABEL, patent
	1V80792A17	ASSEM; battery contacts; NLN6851C
	or1V80792A19	ASSEM; battery contacts; NLN6856C
	54A86541C	LABEL, FCC

NLN6672A Kit, Battery Cover
NLN6752A Kit, Battery Cover

EPD-23769-C

	15C831321H03	COVER, battery; NLN6677A
	or15D853939H03	COVER, battery
	38D84498H01	BUTTON, 1/4 turn
	or38D83542H01	BUTTON, 1/4 turn; NLN6677A
	4C83799H02	WASHER, inculating; 2 req'd
	55D84499H01	LATCH, 1/4 turn
	or55A83543H01	LATCH, 1/4 turn; NLN6677A
	33C82554J01	LABEL
	54B82581J01	LABEL, battery kit

NLN8039A Relay and Board

EPD-24995-A

C150, 154	21K861437	CAPACITOR, fixed: 100 pF ±10%, 75V; N2200
CR105	48C823630E03	SEMICONDUCTOR DEVICE, diode: SEE NOTE I silicon
K101	80D842290H01	RELAY: SEE NOTE III contact arrangement; 1 form "C"; 940Ω ±10%
NON-REFERENCED ITEMS		
	22A84292H01	PIN, wire; 3 req'd
	84C84291H01	BOARD, circuit

NLN8155A Frame and Switch Kit, Universal, Carr Sq (1.8 & 5.0 W)
NLN8156A Frame and Switch Kit, Universal, "PL" Sq (1.8 & 5.0 W)

EPD-25372-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C153	21K861437	CAPACITOR, fixed: 100 pF ±10%, 75 V; N2200
J101	64B84361H01	JACK: Male; 4 contact
L122	24D82723H01	COIL, RF: choke; 1.2 uH
R31	1V80702C85	RESISTOR, variable: assem incl 18C83561H02 var: 25ka, ±10%, .25 W and reference parts S2, L122
R40	1V80702C86	assem incl 18C83560H01 var: 5ka, ±10%, .35 W
S2		SWITCH: p/o R31
NON-REFERENCED ITEMS		
	7D83124H01 7D83342H01	FRAME; (NLN8155A) FRAME; (NLN8156A)

NLN6855A Kit, Connector Cover

EPD-21577-O

	1C842721H01 48B84339H01 15C84035H02	SCREW, captive WASHER, "E" spring COVER, receptacle

NLN8057A Misc Parts Kit C1R1 Universal Carr Sq (1.8 W)
NLN8059A Misc Parts Kit C2R1 Universal "PL" Sq (1.8 W)
NLN8065A Misc Parts Kit C2R1 C2R2 Universal Carr Sq (1.8 & 5.0 W)
NLN8066A Misc Parts Kit C2R1 C2R2 Universal "PL" Sq (1.8 & 5.0 W)
NLN8056A Misc Parts Kit C3R1 C4R1 Universal Carr Sq (1.8 & 5.0 W)
NLN8070A Misc Parts Kit C3R3 C4R4 Universal "PL" Sq (1.8 & 5.0 W)
NLN8073A Misc Parts Kit C5R5 C6R6 Universal Carr Sq (1.8 W)
NLN8074A Misc Parts Kit C5R5 C6R6 Universal "PL" Sq (1.8 W)

EPD-25025-A

C80, 81 C73	23D82397D17 21D84008H01	CAPACITOR, fixed: 15 uF ±20%, 15 V 0.01 uF ±10%; 35 V (NLN8059A, NLN8066A, NLN8070A, NLN8074A)
C8+	21K861427	4 pF; N150 (NLN8057A, NLN8059A)
C301	21K861430 or21D82877B08	10 pF; N150 (136-150.8 MHz) 2.8 pF; NP0 (150.8-162 MHz) Omit C301 for 162-174 MHz
L402	24D82723H01	COIL: choke; 1.2 uH (NLN8066A, 8070A), for 5 watt models only
R128	6S185B73	RESISTOR, fixed: 330 Ω ±10%, 1/8 W
S4	40C82065J01	SWITCH: spdt; toggle (NLN8059A, NLN8066A, NLN8070A, NLN8074A)
NON-REFERENCED ITEMS		
	13C835481H03	ESCUTCHEON (NLN8057A)
	13C835481H04	ESCUTCHEON (NLN8059A)
	13C841361H05	ESCUTCHEON (NLN8065A)
	13C841361H06	ESCUTCHEON (NLN8066A)
	13C842711H05	ESCUTCHEON (NLN8066A)
	13C842711H07	ESCUTCHEON (NLN8070A)
	13C841361H01	ESCUTCHEON (NLN8073A)
	13C841361H04	ESCUTCHEON (NLN8074A)

NLN6853A Kit, Sleeve C4R4 C3R3 Universal Carr Sq (1.8 & 5.0 W)
NLN6867A Kit, Sleeve C1R1 Carr Universal Sq (1.8 & 5.0 W)
NLN6868A Kit, Sleeve C2R2 C2R1 Universal Carr Sq (1.8 & 5.0 W)
NLN6876A Kit, Sleeve C1R1 Universal "PL" Sq (1.8 & 5.0 W)

EPD-23604-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C149	21K861437	CAPACITOR, fixed: pF: 100 ±10%, 75 V SEMICONDUCTOR DEVICE, diode: (SEE NOTE I) silicon junction RD1343
CR104	48C82392B03	
L201, 202, 203, 204, 205, 206	24D83638H14	COIL, RF: CODED; BLU-VIO, 23 turns 76B82451B09 core, tuning
L301, 302, 303, 304, 305, 306	24D83638H13	CODED; RED-BLU, 9-1/2 turns 76B82451B08 core, tuning
R129	6S127802	RESISTOR, fixed: ±10%; 1/4 W unless stated 1k
R201, 202, 203, 204, 205, 206	6S127801	470
R301, 302, 303, 304, 305, 306	6S129432	820
S1	40C834711H05 or40C834711H03 or40C842141H05 1V80789A23	SWITCH, rotary: rotary; 2 position (NLN6877A only) rotary; 4 position (NLN6841A only) rotary; 6 position (NLN6860A, NLN6861A) P-T-T; include 14A83568H01 insulator
S101	1V80789A25	CRYSTAL, quarts: (SEE NOTE 2) 136-174 MHz (1.8 watt models only) 150.8-174 MHz (5 watt models only)
Y201, 202, 203, 204, 205, 206, 301, 302, 303, 304, 305, 306	YYSR-83 or YBSR-83	
NON-REFERENCED ITEMS		
	15E84484H01	HOUSING, frame extension ("PL" only)
	or15D84270H01	HOUSING, frame extension Carr. Sq. only
	36C84115H01	KNOB, control
	3A83174C02	SCREW, set
	36C84257H01	LEVER, actuator
	22B82591C02	PIN, roll
	38C83130H02	BUTTON, switch actuator (female)
	41A83567H01	SPRING, compression
	38C83130H01	BUTTON, switch actuator (male)
	43A83569H01	SLEEVE, switch
	2A83570H01	NUT special (1/4-32)
	41A82680D03	SPRING, compression
	2A82653D05	NUT, special
	4A82453E03	WASHER, nylon
	43B84073H03	BUSHING, cover-mounting
	or43B84073H01	BUSHING, cover-mounting (NLN8660A)
	32B82172J01	GASKET, (Carrier Sq.)
	32B82172J02	GASKET, ("PL")

NLN6854A Frame and Switch Universal Carr Sq
NLN8045A Frame and Switch Universal "PL" Sq

EPD-25024-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C149	21K861437	CAPACITOR, fixed: pF: 100 ±10%, 75 V
J101	64B84361H01	Male: 4 contact
CR104	48C82392B03	SEMICONDUCTOR DEVICE, diode: (SEE NOTE I) silicon junction RD1343
L201, 202, 203, 204, 205, 206	24D83638H14	COIL, RF: CODED; BLU-VIO 23 turns 76B82451B09 core, tuning
L301, 302, 303, 304, 305, 306	24D83638H13	CODED; RED-BLU 9-1/2 turns 76B82451B08 core, tuning
R4	1V80700C64	RESISTOR, fixed: ±10% 1/4 W; unless stated 1k
R129	6S127802	
R201, 202, 203, 204, 205, 206	6S127801	470
R301, 302, 303, 304, 305, 306	6S129432	820
S1	40C83471H05 or40C83471H03	SWITCH, rotary: 2 position, (NLN6868A only) 4 position, 2 pole (NLN6853A only)
S101	1V80789A23	P-T-T, include 14A83568H01 insulator
Y201, 202, 203, 204, 205, 206, 301, 302, 303, 304, 305, 306	YYSR-83 or YBSR-83	CRYSTAL, quarts: (SEE NOTE 2) 136-174 MHz (1.8 watt models only) 150.8-174 MHz (5 watt models only)
NON-REFERENCED ITEMS		
	43B83553H03	BUSHING, actuator
	7B83553H01	BRACKET, switch
	38C83130H03	BUTTON, switch actuator (male)
	41A83567H01	SPRING, compression
	38C83130H01	BUTTON, switch actuator (male)
	43A83569H01	SLEEVE, switch
	2A83570H01	NUT special (1/4-32)
	41A82680D03	SPRING, compression
	2A82653D05	NUT, special
	4A82453E03	WASHER, nylon
	43B84073H03	BUSHING, cover-mounting
	or43B84073H01	BUSHING, cover-mounting (NLN8660A)
	32B82172J01	GASKET, (Carrier Sq.)
	32B82172J02	GASKET, ("PL")

NLN8044A Frame and Switch Universal Carr Sq
NLN8045A Frame and Switch Universal "PL" Sq

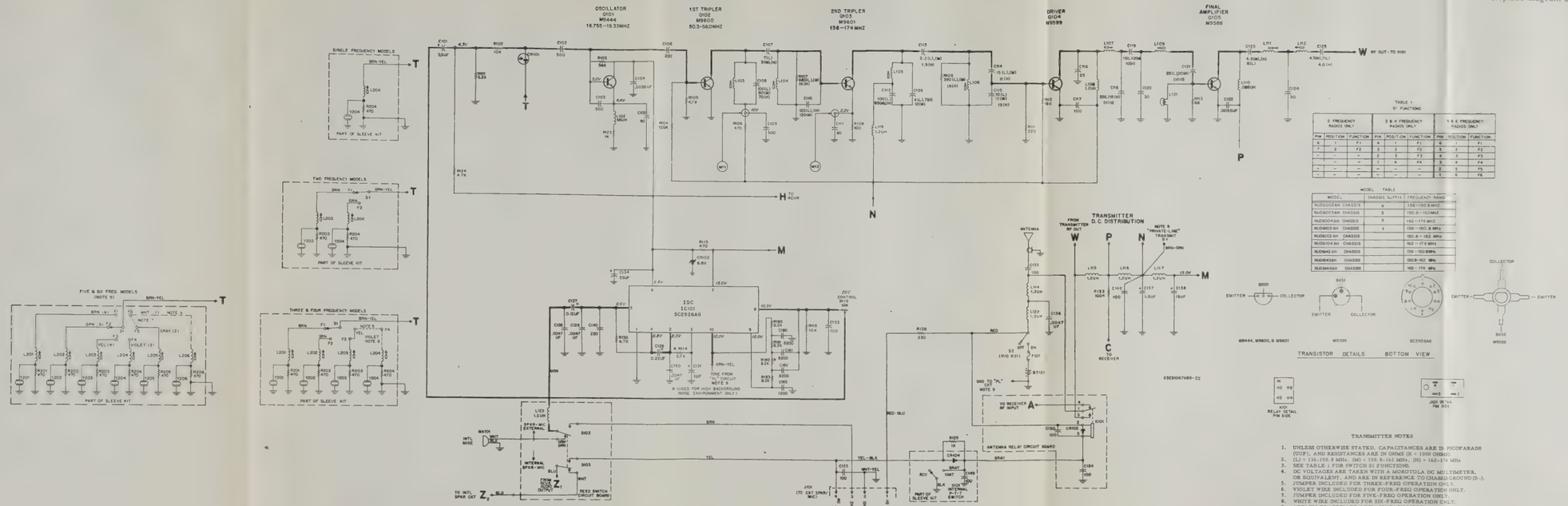
EPD-25024-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C149	21K861437	CAPACITOR, fixed: pF: 100 ±10%, 75 V
J101	64B84361H01	Male: 4 contact
CR104	48C82392B03	SEMICONDUCTOR DEVICE, diode: (SEE NOTE I) silicon junction RD1343
L201, 202, 203, 204, 205, 206	24D83638H14	COIL, RF: CODED; BLU-VIO 23 turns 76B82451B09 core, tuning
L301, 302, 303, 304, 305, 306	24D83638H13	CODED; RED-BLU 9-1/2 turns 76B82451B08 core, tuning
R4	1V80700C64	RESISTOR, fixed: ±10% 1/4 W; unless stated 1k
R129	6S127802	
R201, 202, 203, 204, 205, 206	6S127801	470
R301, 302, 303, 304, 305, 306	6S129432	820
S1	40C83471H05 or40C83471H03	SWITCH, rotary: 2 position, (NLN6868A only) 4 position, 2 pole (NLN6853A only)
S101	1V80789A23	P-T-T, include 14A83568H01 insulator
Y201, 202, 203, 204, 205, 206, 301, 302, 303, 304, 305, 306	YYSR-83 or YBSR-83	CRYSTAL, quarts: (SEE NOTE 2) 136-174 MHz (1.8 watt models only) 150.8-174 MHz (5 watt models only)
NON-REFERENCED ITEMS		
	43B83553H03	BUSHING, actuator
	7B83553H01	BRACKET, switch
	38C83130H03	BUTTON, switch actuator (male)
	41A83567H01	SPRING, compression
	38C83130H01	BUTTON, switch actuator (male)
	43A83569H01	SLEEVE, switch
	2A83570H01	NUT special (1/4-32)
	41A82680D03	SPRING, compression
	2A82653D05	NUT, special
	4A82453E03	WASHER, nylon
	43B84073H03	BUSHING, cover-mounting
	or43B84073H01	BUSHING, cover-mounting (NLN8660A)
	32B82172J01	GASKET, (Carrier Sq.)
	32B82172J02	GASKET, ("PL")

instruction manual revision FMR-164A

For 68P81067A85-A

Replace diagram 63E81067A89-C1 with this diagram 63E81067A89-C2



2 FREQUENCY RADIOS ONLY			3 & 4 FREQUENCY RADIOS ONLY			5 & 6 FREQUENCY RADIOS ONLY		
PIN	POSITION	FUNCTION	PIN	POSITION	FUNCTION	PIN	POSITION	FUNCTION
5	1	F1	5	1	F1	5	1	F1
7	2	F2	7	2	F2	7	2	F2
–	–	–	2	3	F3	4	3	F3
–	–	–	1	4	F4	3	4	F4
–	–	–	–	–	–	2	5	F5
–	–	–	–	–	–	1	6	F6

TABLE 1 S1 FUNCTIONS

MODEL	CHASSIS SUFFIX	FREQUENCY RANGE
RUD5002AH CHASSIS	4	136-150.8 MHZ
RUD6013AH CHASSIS	3	150.8 - 162 MHZ
RUD6004AH CHASSIS	3	162 - 174 MHZ
RUD6902AH CHASSIS	4	136 - 150.8 MHz
RUD6103AH CHASSIS		150.8 - 162 MHz
RUD6104AH CHASSIS		162 - 174 MHz
RUD6842AH CHASSIS		136 - 150.8MHz
RUD6843AH CHASSIS		150.8 - 162 MHz
RUD6844AH CHASSIS		162 - 174 MHz

MODEL TABLE

M9444, M9600, & M9601 M9599 SC2926A0

TRANSISTOR DETAILS BOTTOM VIEW

KDK RELAY DETAIL PIN SIDE

JQX DETAIL PIN SIDE

TRANSMITTER NOTES

1. UNLESS OTHERWISE STATED, CAPACITANCES ARE IN PICOFARADS (DUF), AND RESISTANCES ARE IN OHMS (K = 1000 OHMS).
2. (L) = 136-150.8 MHz, (M) = 150.8-162 MHz, (H) = 162-174 MHz
3. SEE TABLE 1 FOR SWITCH S1 FUNCTIONS.
4. DC VOLTAGES ARE TAKEN WITH A MOROTOLA DC MULTIMETER, OR EQUIVALENT, AND ARE IN REFERENCE TO CHASSIS GROUND (B-).
5. JUMPER INCLUDED FOR THREE-FREQ OPERATION ONLY.
6. VIOLET WIRE INCLUDED FOR FOUR-FREQ OPERATION ONLY.
7. JUMPER INCLUDED FOR FIVE-FREQ OPERATION ONLY.
8. WHITE WIRE INCLUDED FOR SIX-FREQ OPERATION ONLY.
9. APPLIES TO "PRIVATE-LINE" SQUELCH MODELS ONLY.
10. OPERATING FREQUENCIES:

f_c = CARRIER FREQUENCY

f_o = OSCILLATOR FREQUENCY

$f_o = \frac{f_c}{n}$

PREVIOUS REVISIONS AND PARTS LIST SHOWN ON BACK OF THIS DIAGRAM

Transmitter Portion
Carrier & "Private-Line" Squelch
Universal Speaker/Microphone
Schematic Diagram
Motorola No. 63E81067A89-C2
1/25/72 -GCC

EPD-2488-O

DESCRIPTION
3 Universal Carr Sq (1.8 & 5.0 W)
r Universal Sq (1.8 & 5.0 W)
1 Universal Carr Sq (1.8 & 5.0 W)
versal "PL" Sq (1.8 & 5.0 W)

EPD-23604-D

CAPACITOR, fixed: pF
100 ±10%; 75 V
SEMICONDUCTOR DEVICE,
diode: (SEE NOTE 1)
silicon junction RD1343
COIL, RF:
CODED; BLU-VIO
23 turns
76B82451B09 core, tuning
CODED; RED-BLU
9-1/2 turns
76B82451B08 core, tuning
RESISTOR, fixed: Ω ±10%;
1/4 W; unless stated
1k
470
820
SWITCH, rotary:
2 position, (NLN6868A only)
4 position, 2 pole (NLN6853A only)
P-T-T, include 14A83568H01 insulator
CRYSTAL, quartz:
(SEE NOTE 2)
136-174 MHz (1.8 watt models only)
150.8-174 MHz (5 watt models only)
CED ITEMS
BUSHING, actuator
BRACKET, switch
BUTTON, switch actuator (male)
BUTTON, switch actuator (NLN6876A)
SLEEVE, switch
SPRING, compression
SPRING, compression (NLN6867A)
PIN, roll
NUT, special (1/4-32)
SUPPORT, crystal mounting
KNOB, control
SCREW, set
HOUSING, frame (NLN6853A, 6868A)
HOUSING, frame (NLN6867A)
HOUSING, frame (NLN6876A)
GASKET, (Carrier Sq.)
GASKET, ("PL")

nce, order replacement diodes
prola part number only.
e Radio Model only. When
specify carrier frequency,
crystal type number. Proper
d crystal type will be found

101, it is advisable to order relay
ently due to likelihood of damaging
ioval.

NLN8044A Frame and Switch Universal Carr Sq
NLN8045A Frame and Switch Universal "PL" Sq

EPD-25024-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C153	21K861437	CAPACITOR, fixed: 100 pf ±10%; 75 v
J101	64B84361H01	JACK: Male: 4 contact
L122	24D82723H01	COIL, RF: choke; 1.2 uh
R31	1V80700C65	RESISTOR, variable: assem incl 18C83561H02 var: 25K ±10%; .25 w and reference parts S2, L122
R40	1V80700C64	assem incl 18C83560H01 var: 5K ±10%; .35 w
S2		SWITCH: p/o of R31
NON-REFERENCED ITEMS		
	7D83124H01	FRAME: (NLN8044A)
	7D83342H01	FRAME: (NLN8045A)

NLN8057B Misc Parts Kit C1R1 Universal Carr Sq (1.8 W)
NLN8059B Misc Parts Kit C1R1 Universal "PL" Sq (1.8 W)
NLN8065B Misc Parts Kit C2R1 C2R2 Universal Carr Sq (1.8 & 5.0 W)
NLN8066B Misc Parts Kit C2R1 C2R2 Universal "PL" Sq (1.8 & 5.0 W)
NLN8069B Misc Parts Kit C3R3 C4R4 Universal Carr Sq (1.8 & 5.0 W)
NLN8070B Misc Parts Kit C3R3 C4R4 Universal "PL" Sq (1.8 & 5.0 W)
NLN8073B Misc Parts Kit C5R5 C6R6 Universal Carr Sq (1.8 W)
NLN8074B Misc Parts Kit C5R5 C6R6 Universal "PL" Sq (1.8 W)

PLF-219-O

C73	21D84008H01	CAPACITOR, fixed: 0.01 uF ±10%; 35 V (NLN8059B, NLN8066B, NLN8070B, NLN8074B)
C86	21K861427	4 pF; N150 (NLN8057B, NLN8059B)
C301	21K861430 or 21D82877B08	10 pF; N150 (136-150.8 MHz) 2.8 pF; NP0 (150.8-162 MHz) Omit C301 for 162-174 MHz)
L402	24D82723H01	COIL: choke; 1.2 uH (NLN8066B, 8070B), for 5 watt models only
R128	6S185B73	RESISTOR, fixed; 330Ω ±10%; 1/8 W
S4	40C82085J03	SWITCH: spdt; toggle (NLN8059B, NLN8066B, NLN8070B, NLN8074B)
NONREFERENCED ITEMS		
	13C83548H03	ESCUTCHEON (NLN8057B)
	13C83548H04	ESCUTCHEON (NLN8059B)
	13C84136H05	ESCUTCHEON (NLN8065B)
	13C84136H06	ESCUTCHEON (NLN8066B)
	13C84271H05	ESCUTCHEON (NLN8069B)
	13C84271H07	ESCUTCHEON (NLN8070B)
	13C84136H01	ESCUTCHEON (NLN8073B)
	13C84136H04	ESCUTCHEON (NLN8074B)

Manual No. 68P81067A85-A
136-174 MHz HT220 Radio, 1.8 Watts
(Replaces FMR-135, 147 and 148)

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

REVISION DETAILS

With this change the following becomes effective:

Schematic Diagram	New Issue	Ckt. Bd. Detail	Kit Number	Suffix	Item No.
General Information		------	------	-----	(1)
63E81067A88	D	PEPD-24945-D	NUD6002AH	5	(2)
63E81067A89	D	PEPD-24947-E	NUD6003AH	4	
		PEPD-24946-E	NUD6004AH	4	
		PEPD-24949-E	NUD6102AH	2	
			NUD6103AH	1	
			NUD6104AH	1	
63E81117A66	B3		NLN6685A	None	(3)
63E81059A64	A3		NLN6756A	None	
63E81067A86	C	------	NUD6002AH	6	(4)
63E81067A87	C		NUD6003AH	5	
63E81067A88	E		NUD6004AH	5	
63E81067A89	E		NUD6032AH	2	
			NUD6033AH	4	
			NUD6034AH	4	
			NUD6102AH	3	
			NUD6103AH	2	
			NUD6104AH	2	
63E81119A90	B1	----	------	-	(5)

CHANGES

(1) BUREAU OF MINES RADIOS

Radios with Bureau of Mines labels have been approved for use in gassy coal mines. The modification consists of a Bureau of Mines label, rubber-covered antenna, and an approved battery.

REVISIONS

DIAG ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION	REFER TO CIRCUIT BOARD
A	NUD6002AH-2 NUD6003AH-2 NUD6004AH-2	R104A R108A R112A	ADDED 68185-13 ADDED 68185B79 ADDED 68185C04	ACROSS R104 ACROSS R108 ACROSS R112	PEPD-24945-A PEPD-24946-A PEPD-24947-A PEPD-24949-A
B	NUD6002AH-3 NUD6003AH-3 NUD6004AH-3 NUD6102AH NUD6103AH NUD6104AH	R108A R104 R108A R108 R112A R112	REMOVED. WAS 68185B79, fixed: 1k ±10%, 1/8 W ADDED 68185B79, fixed: 1k ±10%, 1/8 W WAS 68185C04, fixed: 2.2k ±10%, 1/8 W REMOVED. WAS 68185B79, fixed: 1k ±10%, 1/8 W WAS 68185C04, fixed: 2.2k ±10%, 1/8 W ADDED NEW MAS-TER PARTS NUMBER WAS 68185B79 WERE 68185B79 THRU 106 REMOVED. WAS 68185C04, fixed: 2.2k ±10%, 1/8 W WAS 68185B79, fixed: 1k ±10%, 1/8 W ADDED NEW MAS-TER PARTS NUMBER	ACROSS R104 Q102 BASE Q102 EMITTER ACROSS R108 Q103 BASE Q103 EMITTER ACROSS R112 Q104 BASE PARTS LIST PARTS LIST PARTS LIST	PEPD-24945-B PEPD-24946-B PEPD-24947-B PEPD-24949-B NONE NONE NONE
B1	NLN6853A N2001 NLN6868A NLN6870A NLN6880A NLN6881A NLN6877A NLN6841A	S4	WAS 40AR2090H02	PARTS LIST	NONE
B2	NLN8059A NLN8066A NLN8070A NLN8074A	S4	WAS 40AR2090H02	PARTS LIST	NONE
B3	NLN8059A NLN8066A NLN8070A NLN8074A	L401	REMOVED	PARTS LIST	PEPD-24945 PEPD-24946 PEPD-24947 PEPD-24949
	NLN8069A NLN8073A NLN8074A	L81	WAS 50D83466D02	PARTS LIST	
	NUD6102AH-4 NUD6103AH-4	C439	WAS 21D82877B13, p/f, 136-150.8 MHz	PARTS LIST	PEPD-24945 PEPD-24946 PEPD-24947 PEPD-24949
		C160	REMOVED 21K864012, 60 pF, 136-150.8 MHz CIRCUIT WAS AS SHOWN BELOW 2ND TRIPLER Q103 M9601 136→174 MHz		
		C161	REMOVED 21K861431, 12 pF, 136-150.8 MHz CIRCUIT WAS AS SHOWN BELOW		
C1	NLN6477A NLN6752A	NON-REF	WAS 15C83132H01 or 15D83939H02 COVER ADDED 15C82564J01 LABEL 5A82583J01 LABEL, BATTERY	PARTS LIST	NONE
C2	NUD6142AH NUD6143AH NUD6144AH	NEW MODELS ADDED TO REPLACE NUD6102AH, NUD6103AH, AND NUD6104AH RESPECTIVELY			
	MISC PARTS KIT "B" SERIES	REPLACED "A" SERIES MISC PTS KITS. C49 AND C431 NOW PART OF NUD6142AH, NUD6143AH, AND NUD6144AH MODELS (REVR PORTION)			

PARTS LIST

NUD6002AH 1.8 watt Unified Board (Xmtr, Portion)136-150.8 MHz
NUD6003AH 1.8 watt Unified Board (Xmtr, Portion)150.8-162 MHz
NUD6004AH 1.8 watt Unified Board (Xmtr, Portion)162-174 MHz
NUD6102AH 1.8 watt Unified Board (Xmtr, Portion)136-150.8 MHz
NUD6103AH 1.8 watt Unified Board (Xmtr, Portion)150.8-162 MHz
NUD6104AH 1.8 watt Unified Board (Xmtr, Portion)162-174 MHz
NUD6142AH 1.8 watt Unified Board (Xmtr, Portion)136-150.8 MHz
NUD6143AH 1.8 watt Unified Board (Xmtr, Portion)150.8-162 MHz
NUD6144AH 1.8 watt Unified Board (Xmtr, Portion)162-174 MHz

EPD-25026-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: pF ±10%; 75 V; unless stated
C101	23D82397D28	3.3 uF ±20%, 20 V
C102, 103, 109	21K861461	500; N4700
C104, 122	21D83221E01	.0055 uF ±100-0%; Y5D
C105	21K859202	90; N750
C106	21K868829	220; N1400
C107	21D82877B13	7; N150; 136-150. 8 MHz
	or21D82877B21	5; N150; 150. 8-174 MHz
C108	21D82358G12	100 ±5%; N080; 136-150. 8 MHz
	or21K864067	80; N150; 150. 8-162 MHz
	or21K861435	70; N150; 162-174 MHz
C110	21D82358G18	125; N750; 136-150. 8 MHz 162-174 MHz
	or21D82877B15	120; N150; 150. 8-162 MHz
C111	21D82877B32	80; N90
C112	21K861436	100; N750; 136-150. 8 MHz
	or21D82358G16	65; N080; 150. 8-174 MHz
C113	21K861426	2.2; N150; 136-162 MHz
	or21D82450B27	1.5; 162-174 MHz
C114	21K861462	15; N150; 136-162 MHz
	or21D82877B45	11; N150; 162-174 MHz
C115	21K861430	10; N150; 136-150. 8 MHz
	or21K861431	12. N150; 150. 8-162 MHz
	or21K861462	15; N150; 162-174 MHz
C116	21K861597	25; N150
C117, 133, 135, 142, 153	21K861437	100; N2200
C118	21K865197	25; N150; 136-150. 8 MHz
	or21D82877B46	18; N150; 150. 8-162 MHz
	or21K861431	12; N150; 162-174 MHz
C119	21K861462	15; N150; 136-150. 8 MHz
	or21K861431	12; N150; 150. 8-162 MHz
	or21D82877B23	10; N150; 162-174 MHz
C120, 124	21D82877B06	30; N150
C121	21K865197	25; N150; 136-150. 8 MHz
	or21K861432	20; N150; 150. 8-162 MHz
	or21K861462	15; N150; 162-174 MHz
C123	21K867807	8; N080; 136-150. 8 MHz
	or21D82358G02	6. 8; NP0; 150. 8-174 MHz
C125	or21D82877B13	7; N150; 136-150. 8 MHz
	or21D82877B37	4. 3; NP0; 150. 8-162 MHz
	or21K861427	4; N150; 162-174 MHz
C126, 128, 130, 136	21D82213E07	4700; 100 V; X5R
C127	23D82397D12	.12 uF; 20 V
C129	23D82397D06	.22 uF +40-20%; 35 V
C131	23D82397D07	1 uF; 20 V
C134	23D82397D18	33 uF; 10 V
C137	23D82397D27	1. 5 uF; 20 V
C138	23D82397D17	15 uF; 20 V
C139	21K861427	4; N150; 136-150. 8 MHz
	or21K861431	12; N150; 150. 8-162 MHz
	or21D82877B13	7; N150; 162-174 MHz
C140	21K861438	220; N1400
C180, 181, 182	21D84008H04	8200; 50 V
C183	21D82213E14	1200 ±5%; 100 V; Y5D
		SEMICONDUCTOR DEVICE, diode: SEE NOTE I
CR101	48C82190H09	varactor, silicon TM5182
CR102	48C82256C47	sensor, silicon; 6. 8 V
		INTEGRATED CIRCUIT: L. D. C. -SC1926AG
IC101	51R83395E02	
		COIL, RF:
L102	24D82549D13	choke; 68 uH

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
L103	24D83638H03	coded, BLU-GRN; 4-1/4 turns 76B82451B07 core, tuning
L104	24D83639H04	coded, BRN; 3-1/4 turns 76B82451B07 core, tuning
L105	24D83638H05	coded, GRN; 5-1/4 turns 76B82451B07 core, tuning (136-150. 8 MHz)
	or24D83638H07	coded, YEL; 3-3/4 turns 76B82451B07 core, tuning (150. 8-174 MHz)
L106	24D83638H07	coded, YEL; 3-3/4 turns 76B82451B07 core, tuning
L107	24D83638H06	coded, ORG-BRN; 2-3/4 turns 76B82451B07 core, tuning
L108, 114, 115, 116, 117, 119	24D82723M01	choke, 1. 2 uH
L109	24D83638H08	coded, BRN-RED; 3-1/2 turns 76B82451B07 core, tuning
L110	24D82723H18	choke, . 085 uH
L111, 112	24D83639H09	coded, ORG-BLU; 8-1/4 turns 76B82451B09 core, tuning
L121	24C83961B01	choke, BRN; 3 turns Refer to frame and switch kits
L122		TRANSISTOR: SEE NOTE I
Q101	48R869444	N-P-N; type M9444
Q102	48R869600	N-P-N; type M9600
Q103	48R869601	N-P-N; type M9601
Q104	48R869599	N-P-N; type M9599
Q105	48R869588	N-P-N; type M9588
R101	68185B90	RESISTOR, fixed: ±10%; 1/8 W; unless stated
R100, 118	68185B91	10k
R103	68185C01	56k
R104	68185C05	120k
R105	68185B87	4. 7k
R106	68185B75	470
R107	68185B77	680; 136-162 MHz
	or68185B79	1k; 162-174 MHz
R108	68185B67	100
R109	68185B79	1k; 162-174 MHz
	or68185B74	390; 136-162 MHz
R111	68185B83	220
R112	68185B84	18k
R113	68185B65	68
R114	68185B84	2. 7k
R115	68127801	470; 1/4 W
R119	18C82876B06	var, 10k
R122	68185C94	100k
R123	68185B79	1k
R124	68185B87	4. 7k
R130	68185A65	4. 7k ±5%
R180, 181, 182, 183	68185A71	8. 2k ±5%

NLN6852B Kit, Back Cover
NLN6848B Kit, Back Cover

EPD-24981-O

	15C84269H02	COVER, back; NLN6852B
	15D84511H02	COVER, back; NLN6848B
	3A82210E09	SCREW, captive, 2 req'd
	3A82210E05	SCREW, captive, 2 req'd
	4C82418B09	WASHER, nylon, 4 req'd
	32B82172101	GASKET

NLN6851C Front Cover, Universal, Carrier Squelch, Omni-Housing
NLN6858C Front Cover, Universal, Private-Line, Omni-Housing

EPD-24980-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C88, 89	23C82397D16	CAPACITOR, fixed: 22. 0 uF ±20%; 15 V
F101	6SB2896B04	FUSE, cartridge: miniature, 2. 0 amp; 125 V
LS1	50D83466D05	SPEAKER, dynamic; 2" dia. imped: 39Ω
MK101		MICROPHONE, dynamic; res 630Ω; impedance 350Ω, at 1 kHz (field repairable; for replacement order complete front cover)
		NON-REFERENCED ITEMS
	14B8228Z01	INSULATOR, speaker
	4K840914	WASHER, spring; 2 req'd
	4K848065	WASHER, retaining; 2 req'd
	32B82172J02	GASKET, "O" ring; NLN6856C
	or32B82172J01	GASKET, "O" ring; NLN6851C
	42B84079101	CLAMP
	14A83292E05	INSULATING TAPE, cover; 2 req'd
	33B83680101	NAMEPLATE
	7B84030H03	BRACKET, retaining
	41B84029101	SPRING, latch
	1V80786A80	ASSY, lead and lug (RED)
	1V80786A81	ASSY, lead and lug (BLK)
	1V80791A99	ASSY, lead and lug (BLU) NLN6856C
	1V80786A82	ASSY, lead and lug (BLU)
	13K868710	LABEL, patent
	15C85C01	ASSEM; battery contacts; NLN6851C
	15C84035H02	ASSEM; battery contacts; NLN6856C
	54A865436	LABEL, FCC

NLN6677A Kit, Battery Lover
NLN6752A Kit, Battery Lover

EPD-23769-C

	15C83132H03	COVER, battery; NLN6677A
	or15D83939H03	COVER, battery
	3B84649H01	BUTTON, 1/4 turn
	or3B83542H01	BUTTON, 1/4 turn; NLN6677A
	4C83799H02	WASHER, inculating; 2 req'd
	55B84499H01	LATCH, 1/4 turn
	or55A83543H01	LATCH, 1/4 turn; NLN6677A
	13C82554J01	LABEL
	54B82581J01	LABEL, battery kit

NLN8039A Relay and Board

EPD-24995-A

C150, 154	21K861437	CAPACITOR, fixed: 100 pF ±10%, 75V; N2200
CR105	48C82363E03	SEMICONDUCTOR, DEVICE, diode: SEE NOTE I silicon
K101	80D84229H01	RELAY: SEE NOTE III contact arrangement; 1 form "C"; 940Ω, ±10%
		NON-REFERENCED ITEMS
	22A84292H01	PIN, wire; 3 req'd
	84C84291H01	BOARD, circuit

NLN8155A Frame and Switch Kit, Universal, Carr Sq (1. 8 & 5. 0 W)
NLN8158A Frame and Switch Kit, Universal, "PL" Sq (1. 8 & 5. 0 W)

EPD-25372-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C153	21K861437	CAPACITOR, fixed: 100 pF ±10%; 75 V; N2200
J101	64B84361H01	JACK: Male: 4 contact
L122	24D82723H01	COIL, RF: choke; 1. 2 uH
R40	1V80702C85	RESISTOR, variable; assem incl 18C83561M02 var: 25ka ±10%, . 25 W and reference parts S2, L122
R40	1V80702C86	assem incl 18C83560H01 var: 5ka ±10%, . 35 W
S2		SWITCH: p/o R31
		NON-REFERENCED ITEMS
	7D83124H01	FRAME; (NLN8155A)
	7D83342H01	FRAME; (NLN8158A)

NLN6855A Kit, Connector Cover

EPD-23577-O

	3C84272H01	SCREW, captive
	4B84319H01	WASHER, "E" spring
	15C84035H02	COVER, receptacle

NLN8057A Misc Parts Kit C1R1 Universal Carr Sq (1. 8 W)
NLN8059A Misc Parts Kit C1R1 Universal "PL" Sq (1. 8 W)
NLN8065A Misc Parts Kit C2R1 C2R2 Universal Carr Sq (1. 8 & 5. 0 W)
NLN8066A Misc Parts Kit C2R1 C2R2 Universal "PL" Sq (1. 8 & 5. 0 W)
NLN8069A Misc Parts Kit C3R3 C4R4 Universal Carr Sq (1. 8 & 5. 0 W)
NLN8070A Misc Parts Kit C3R3 C4R4 Universal "PL" Sq (1. 8 & 5. 0 W)
NLN8073A Misc Parts Kit C5R5 C6R6 Universal Carr Sq (1. 8 W)
NLN8074A Misc Parts Kit C5R5 C6R6 Universal "PL" Sq (1. 8 W)

EPD-25025-A

C80, 81	23D82397D17	CAPACITOR, fixed: 15 uF ±20%; 20 V
C73	21D84008H01	0. 01 uF ±10%; 35 V (NLN8059A, NLN8066A, NLN8070A, NLN8074A)
C86	21K861427	4 pF; N150 (NLN8057A, NLN8059A)
C301	21K861430	10 pF; N150 (136-150. 8 MHz)
	or21D82877B06	2. 8 pF; NP0 (150. 8-162 MHz) Omit C301 for 162-174 MHz
L402	24D82723H01	COIL: choke; 1. 2 uH (NLN8066A, 8070A), for 5 watt models only
R128	6S185B73	RESISTOR, fixed: 330 Ω ±10%, 1/8 W
S4	40C82085J03	SWITCH: spdt; toggle (NLN8059A, NLN8066A, NLN8070A, NLN8074A)
		NON-REFERENCED ITEMS
	13C83548H03	ESCUTCHEON (NLN8057A)
	13C83548H04	ESCUTCHEON (NLN8059A)
	13C84136H05	ESCUTCHEON (NLN8065A)
	13C84136H06	ESCUTCHEON (NLN8066A)
	13C84271H05	ESCUTCHEON (NLN8069A)
	13C84271H07	ESCUTCHEON (NLN8070A)
	13C84136H01	ESCUTCHEON (NLN8073A)
	13C84136H04	ESCUTCHEON (NLN8074A)

NLN8040A Reed Switch

EPD-25023-A

L123	24D82723H01	COIL: choke, 1. 2 uH
S102, 103	40C84359H01	SWITCH, reed: contact configuration, 1 form "C"
		NON-REFERENCED ITEMS
	84C84290H01	BOARD, circuit
	22A84292H01	PIN, wire

NLN6846A Sleeve Kit C5R5 C6R6 Universal Carr Sq (1. 8 W)
NLN6847A Sleeve Kit C5R5 C6R6 Universal "PL" Sq (1. 8 W)
NLN6868A Sleeve Kit C2R2 C2R1 Universal "PL" Sq (1. 8 & 5. 0 W)
NLN6841A Sleeve Kit C4R4 C3R3 Universal "PL" Sq (1. 8 & 5. 0 W)

EPD-23580-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C149	21K861437	CAPACITOR, fixed: pF; 100 ±10%; 75 V
CR104	48C82392B03	SEMICONDUCTOR DEVICE, diode: (SEE NOTE 1) silicon junction RD1343
L201, 202, 203, 204, 205, 206	24D83638H14	COIL, RF: CODED: BLU-VIO, 23 turns 76B82451B09 core, tuning
L301, 302, 303, 304, 305, 306	24D83638H13	CODED: RED-BLU, 9-1/2 turns 76B82451B08 core, tuning
R129	6S127802	RESISTOR, fixed: ±10%; 1/4 W unless stated 1k
R201, 202, 203, 204, 205, 206	6S127801	470
R301, 302, 303, 304, 305, 306	6S129432	820
S1	40C83471H05	SWITCH, rotary: 2 position (NLN6877A only)
	or40C83471H03	rotary; 4 position (NLN6841A only)
	or40C84214H02	rotary; 6 position (NLN6860A, NLN6861A)
S101	1V80789A23	P-T-T; include 14A8356S01 insulator
Y201, 202, 203, 204, 205, 206, 301, 302, 303, 304, 305, 306	YY5R-83 or YB5R-83	CRYSTAL, quartz: (SEE NOTE 2) 136-174 MHz (1. 8 watt models only) 150. 8-174 MHz (5 watt models only)
		NON-REFERENCED ITEMS
	15E84484101	HOUSING, frame extension "PL" only
	or15D84270101	HOUSING, frame extension Carr. Sq. only
	36C84135H01	KNOB, control
	3A83174G02	SCREW, set
	36C84275H01	LEVER, actuator
	22B82591C02	PIN, roll
	3C83130H02	BUTTON, switch actuator (female)
	41A83567H01	SPRING, compression
	3C83130H03	BUTTON, switch actuator (male)
	41A83569H01	SLEEVE, switch
	2A83570H01	NUT special (1/4-32)
	41A82680D03	SPRING, compression
	2A82635D05	NUT, special
	4A82451E03	WASHER, nylon
	43B84073H01	BUSHING, cover-mounting
	or43B84073H01	BUSHING, cover-mounting (NLN6860A)
	32B82172J01	GASKET, (Carrier Sq.)
	32B82172J02	GASKET, ("PL" only)

NOTE:

I. For optimum performance, order replacement diodes and transistors by Motorola part number only.

II. Crystals are part of the Radio Model only. When ordering crystal units, specify carrier frequency, crystal frequency, and crystal type number. Proper oscillator frequency and crystal type will be found stamped on crystal can.

III. When ordering relay K101, it is advisable to order relay board and pins concurrently due to likelihood of damaging board during relay removal.

NLN8044A Frame and Switch Universal Carr Sq
NLN8045A Frame and Switch Universal "PL" Sq

EPD-25124-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C151	21K861437	CAPACITOR, fixed: pF 100 ±10%; 75 V
J101	64B843610M01	JACK: Male: 4 contact
L102	24D82723H01	COIL, RF: choke; 1. 2 uh
R40	1V80700C65	RESISTOR, variable assem incl 18C83561M02 var: 25ka ±10%, . 25 w and reference parts S2, L122
R40	1V80700C64	assem incl 18C83560H01 var: 5k ±10%, . 35 w
S2		SWITCH: p/o of R31
		NON-REFERENCED ITEMS
	7D83124H01	FRAME: (NLN8044A)
	7D83342H01	FRAME: (NLN8045A)

NLN8057B Misc Parts Kit C1R1 Universal Carr Sq (1. 8 W)
NLN8059B Misc Parts Kit C1R1 Universal "PL" Sq (1. 8 W)
NLN8065B Misc Parts Kit C2R1 C2R2 Universal Carr Sq (1. 8 & 5. 0 W)
NLN8066B Misc Parts Kit C2R1 C2R2 Universal "PL" Sq (1. 8 & 5. 0 W)
NLN8069B Misc Parts Kit C3R3 C4R4 Universal Carr Sq (1. 8 & 5. 0 W)
NLN8070B Misc Parts Kit C3R3 C4R4 Universal "PL" Sq (1. 8 & 5. 0 W)
NLN8073B Misc Parts Kit C5R5 C6R6 Universal Carr Sq (1. 8 W)
NLN8074B Misc Parts Kit C5R5 C6R6 Universal "PL" Sq (1. 8 W)

EPD-25125-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C73	21D84008H01	CAPACITOR, fixed: 0. 01 uF ±10%; 35 V (NLN8059B, NLN8066B, NLN8070B, NLN8074B)
C86	21K861427	4 pF; N150 (NLN8057B, NLN8059B)
C301	21K861430	10 pF; N150 (136-150. 8 MHz)
	or21D82877B06	2. 8 pF, NP0 (150. 8-162 MHz) Omit C301 for 162-174 MHz
L402	24D82723H01	COIL: choke; 1. 2 uH (NLN8066B, 8070B), for 5 watt models only
R128	6S185B73	RESISTOR, fixed: 330Ω ±10%, 1/8 W
S4	40C82085J03	SWITCH: spdt, toggle (NLN8059B, NLN8066B, NLN8070B, NLN8074B)
		NONREFERENCED ITEMS
	13C83548H03	ESCUTCHEON (NLN8057B)
	13C83548H04	ESCUTCHEON (NLN8059B)
	13C84136H05	ESCUTCHEON (NLN8065B)
	13C84136H06	ESCUTCHEON (NLN8066B)
	13C84271H05	ESCUTCHEON (NLN8069B)
	13C84271H07	ESCUTCHEON (NLN8070B)
	13C84136H01	ESCUTCHEON (NLN8073B)
	13C84136H04	ESCUTCHEON (NLN8074B)

Manual No. 68P81067A85-A
136-174 MHz HT220 Radio, 1.8 Watts
(Replaces FMR-135, 147 and 148)

GENERAL

This revision outlines changes that have occurred since the printing of your instruction manual. Use this information to correct your manual.

REVISION DETAILS

With this change the following becomes effective:

Schematic Diagram	New Issue	Ckt. Bd. Detail	Kit Number	Suffix	Item No.
General Information		------	------	-----	(1)
63E81067A88	D	PEPD-24945-D	NUD6002AH	5	(2)
63E81067A89	D	PEPD-24947-E	NUD6003AH	4	
		PEPD-24946-E	NUD6004AH	4	
		PEPD-24949-E	NUD6102AH	2	
			NUD6103AH	1	
			NUD6104AH	1	
63E81117A66	B3		NLN6685A	None	(3)
63E81059A64	A3		NLN6756A	None	
63E81067A86	C	------	NUD6002AH	6	(4)
63E81067A87	C		NUD6003AH	5	
63E81067A88	E		NUD6004AH	5	
63E81067A89	E		NUD6032AH	2	
			NUD6033AH	4	
			NUD6034AH	4	
			NUD6102AH	3	
			NUD6103AH	2	
			NUD6104AH	2	
63E81119A90	B1	----	------	-	(5)

CHANGES

(1) BUREAU OF MINES RADIOS

Radios with Bureau of Mines labels have been approved for use in gassy coal mines. The modification consists of a Bureau of Mines label, rubber-covered antenna, and an approved battery.

NON-INCENDIVE RADIOS

Radios with Non-Incendive labels have been approved by Factory Mutual Research Corporation. The approval indicates that the radio must be used with a specific battery. The approval certifies that the radio is incapable, under normal operating conditions, of releasing sufficient electrical or thermal energy to cause ignition of specific hazardous material in their most easily ignited concentration in air.

COMPONENT CHANGES

(2)

Ref Sym	Action	Part Number	Description
R184	added	6S124C33	RESISTOR, Fixed: ohms 220 ±10%; 1/4 W

SEE WIRING CHANGES

WIRING CHANGES (See Detail Below)

Lift one end of L117 and R115 (IC101, pin 7). Connect one end of new resistor R184 (220 ohms) to the connection point formerly occupied by L117. Tie the loose ends of L117, R115, and R184 to a common floating connection point.

NOTE

The detail below also shows the correct tie points for capacitor C138 and resistor R115.

⁂⁂⁂ = Original location on Circuit Board Detail

	Ref. Sym.	Action	Part Number	Description
(3)	XDS2 thru 25	Added	9B84806H01	SOCKET, lamp (24 req'd)
(4)	C5 (M, H)	Changed to	21D82450B17	CAPACITOR, fixed: 2.2 pF ±5%, 500 V
	Q1	Changed to	48R869776	TRANSISTOR: NPN; type M9776
	R53	Changed to	6S185B57	RESISTOR, fixed: 15 Ω ±10%, 1/8 W

(5) In battery charger section 68P81119A89 (on Schematic Diagram 63E81119A90), replace EPD-25472-O with EPD-25472-A.

TEST POINT	VOLTAGE DURING CHARGE (RT = 150Ω)	VOLTAGE DURING CHARGE COMPLETE (RT = 1 kΩ)
A	2.7	0.76
B	8.4	0
C	2.8	0.75
D	0.4	1.6
E	17.2	0.8
F	0	2.3
G	17.9	21.5

EPD-25472-A